

The Journal *of the* SOCIETY OF DYERS AND COLOURISTS

Volume 69 Number 12

CONTENTS

COMMUNICATIONS—

- ABSORPTIOMETRIC COLORIMETRY IN THE TEXTILE LABORATORY
(C. H. Giles and I. S. Shaw) 481

THE REACTION BETWEEN WOOL AND NICKELAMMONIUM HYDROXIDE—

- II— THE SUPERCONTRACTION OF WOOL FIBRES IN
SOLUTIONS OF NICKELAMMONIUM HYDROXIDE
(J. W. Bell and C. S. Whewell) 491

CORRESPONDENCE	496
NOTES	497
OBITUARY NOTICE	498
NEW BOOKS AND PUBLICATIONS	498
MANUFACTURERS' PUBLICATIONS AND PATTERN CARDS .	501
ABSTRACTS	502

THE SOCIETY OF DYERS AND COLOURISTS
19 PICCADILLY BRADFORD 1 YORKSHIRE

WAY

PAC

Perfect finishing owes much to

Teepol or Lensex

because of

**NAVY
AGES**

Net and penetrate

Emulsify and suspend

Prevent lime soap formation

Shell Chemicals Limited

(DISTRIBUTORS)

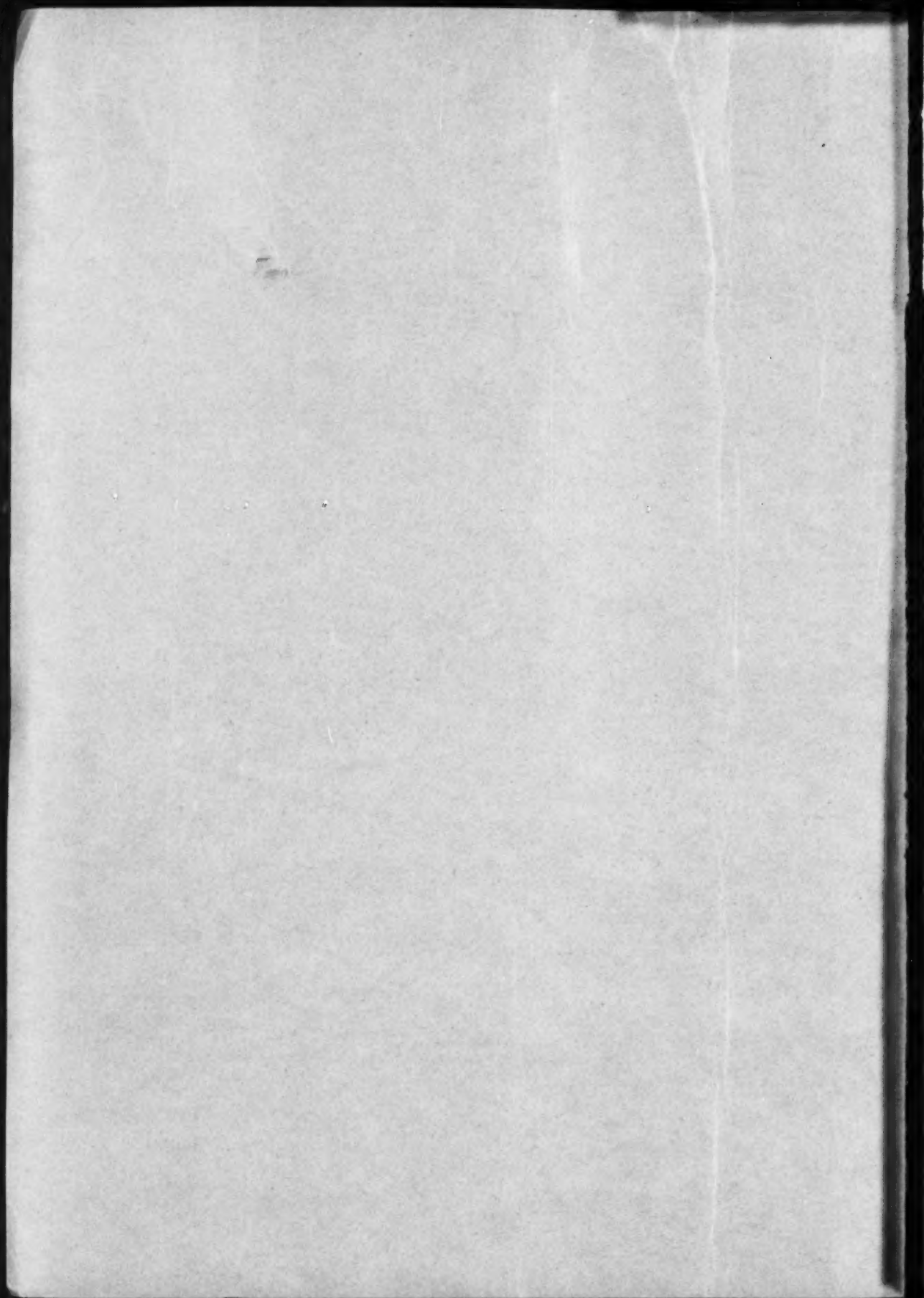


Norman House, 105-109 Strand, London, W.C.2. Telephone: Temple Bar 4455

Divisional Offices: Walter House, Bedford Street, London, W.C.2. Tel: Temple Bar 4455. 42 Deansgate, Manchester, 3. Tel: Deansgate 6451. Clarence Chambers, 39 Corporation Street, Birmingham, 2. Tel: Midland 6954. 28 St. Enoch Square, Glasgow, C.1. Tel: Glasgow Central 9561. 53 Middle Abbey Street, Dublin. Tel: Dublin 45775.

"TEEPOL" and "LENSEX" are Registered Trade Marks

TL16



Perfect finishing owes much to

Teepol or Lensex

*because of
their power to . . .*



Shell Chemicals Limited

(DISTRIBUTORS)

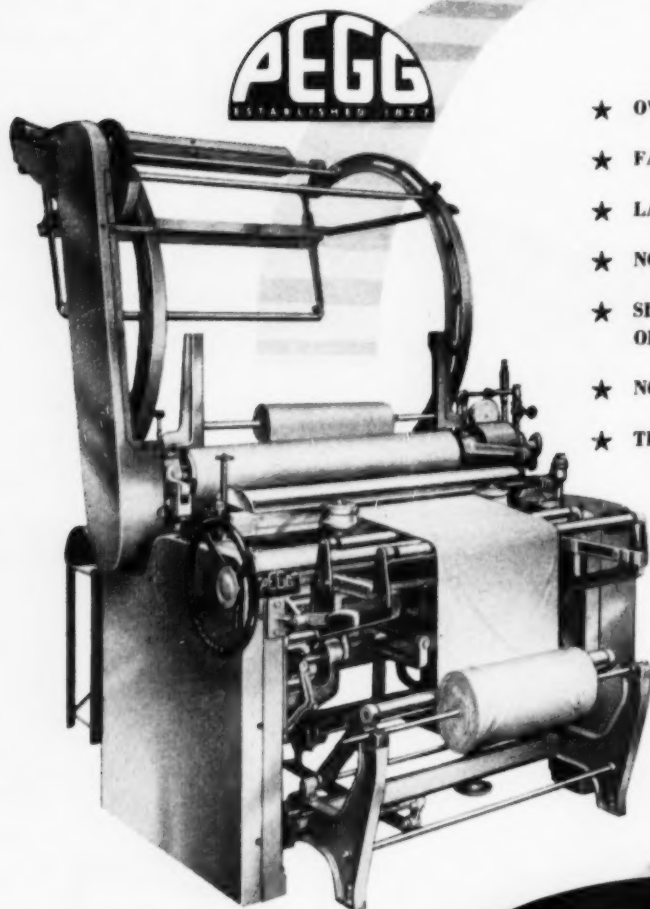


Norman House, 105-109 Strand, London, W.C.2. Telephone: Temple Bar 4455

Divisional Offices: Walter House, Bedford Street, London, W.C.2. Tel: Temple Bar 4455. 42 Deansgate, Manchester, 3. Tel: Deansgate 6451. Clarence Chambers, 39 Corporation Street, Birmingham, 2. Tel: Midland 6954. 28 St. Enoch Square, Glasgow, C.1. Tel: Glasgow Central 9561. 53 Middle Abbey Street, Dublin. Tel: Dublin 43775.

"TEEPOL" and "LENSEX" are Registered Trade Marks

TL16



AEGG
ESTABLISHED 1827

- ★ OVERFEED TO STRETCHER
- ★ FABRIC STEAMED ON STRETCHER
- ★ LARGE-DIAMETER COVERED BOWLS
- ★ NO WASTE AT END OF ROLL
- ★ SIMPLIFIED THREADING FROM FRONT OF MACHINE
- ★ NO BOWING OF COURSES
- ★ THREE-SPEED DRIVE

*Built in 2 sizes
finished fabric widths up to 59"*

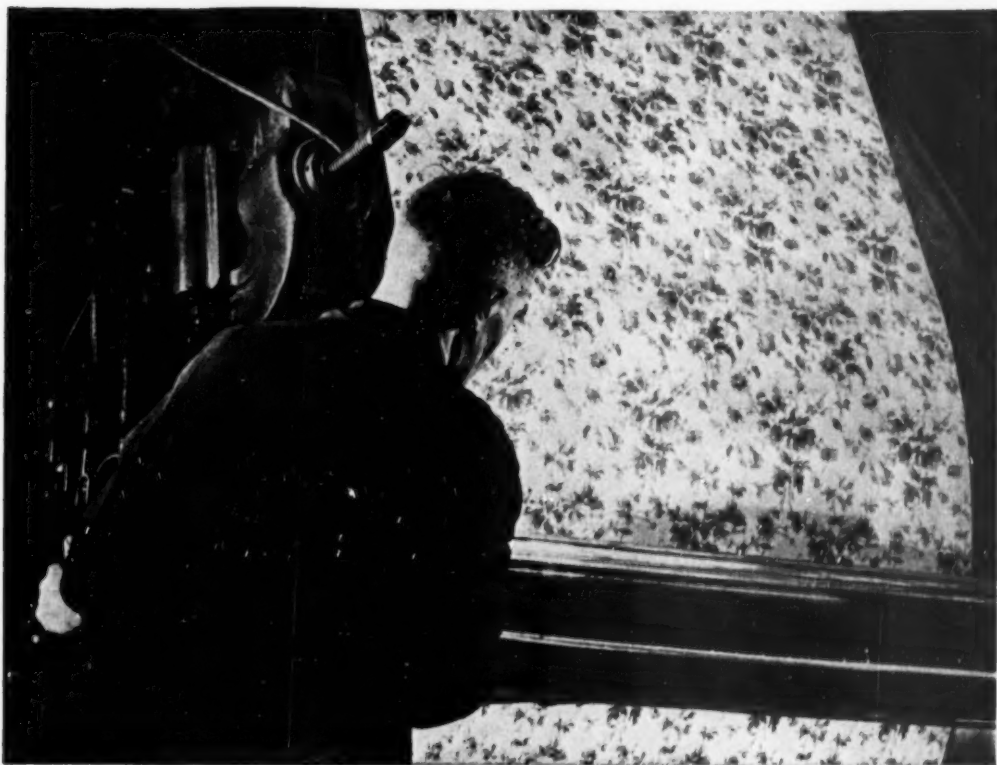
The modern

Horizontal

Calender

gives *Superb Finish* to all classes of circular knitted fabrics

SAMUEL PEGG & SON - BARKBY RD. - LEICESTER - ENGLAND
A COMPANY OF THE MELLOR BROMLEY GROUP



LOOKING ON THE BRIGHT SIDE

Whether your problem is scouring before or after printing or after dyeing, or whether it is dyeing in the piece or by the hank, the chief enemy of good results is lime soap. Lime soap on the fibre produces a harsh feel, streaky results and poor colours. Calgon (Sodium Metaphosphate) used in scouring and dyeing gives better and brighter colours with more certain results, and the piece handles better. The Cotton, Rayon, Silk and Wool industries are finding life much brighter with Calgon. Write for a copy of "Calgon in the Textile Industry"

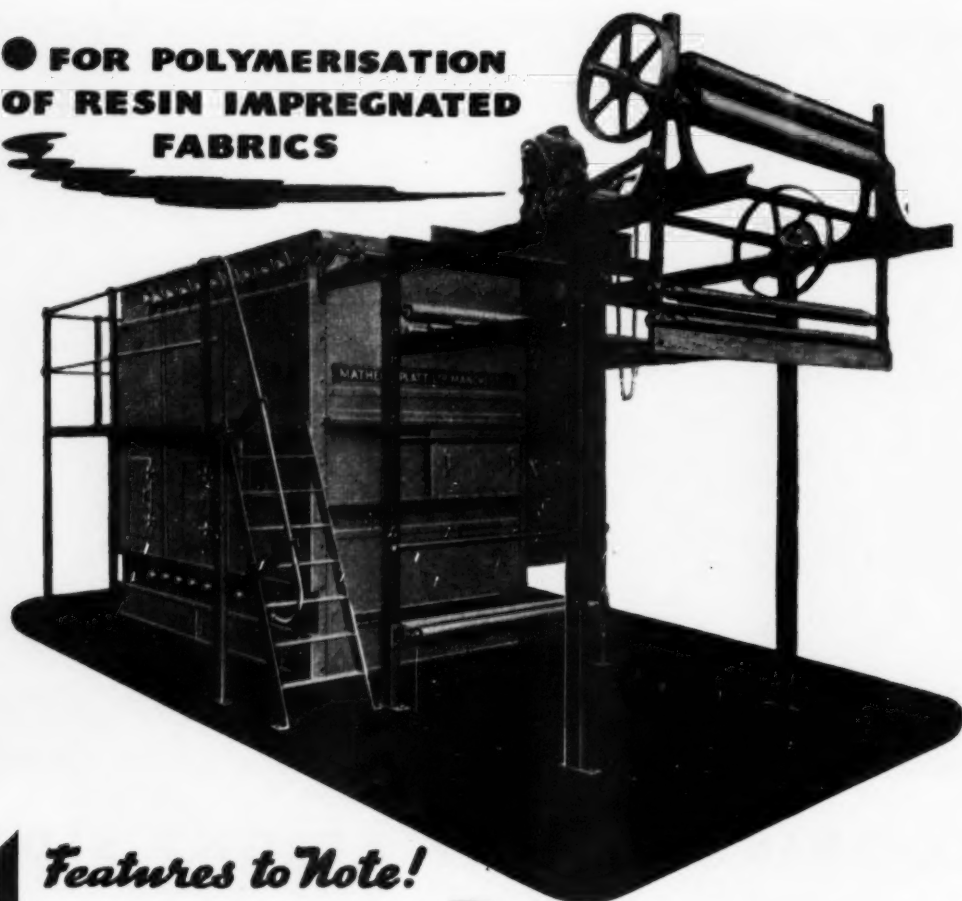
CALGON

for better dyeing and scouring

ALBRIGHT & WILSON LTD • Water Treatment Department
49 PARK LANE • LONDON • W-1 • Telephone: GROsvenor 1311 • Works: Oldbury & Widnes



● FOR POLYMERISATION OF RESIN IMPREGNATED FABRICS



Features to Note!

- Exceptionally high production
- Adequate polymerisation with soft or firm handle as required
- Electrical, gas or steam heating elements as required
- Efficient and automatic temperature control — initial temperature quickly obtained
- Easy access with efficient insulation
- Compact and operative as a separate unit or part of a range
- Efficient air filtration
- Minimum length tension
- Versatile — water repellent and permanent glaze finish

THE MATHER & PLATT

**BAKING
STOVE**

A FINE MACHINE...

Write now for details of the
M & P Service to the Textile Trade

MATHER & PLATT LIMITED

PARK WORKS : MANCHESTER 10



GOOD BODY?

However well garments are dry cleaned customers are dissatisfied if the goods do not have good body and handle.

You can depend upon getting the finish required if you retexture with Howards Resin M.S.2. But that is not all; retextured garments remain clean longer and their life tends to increase when you use this versatile resin. Used with Howards Cyclohexanol Stearate, or other suitable plasticiser, Resin M.S.2 is ideal for retexturing all types of garments, from taffetas to woollens. Working samples and all the information you need are freely at your disposal. Why not write today?

HOWARDS OF ILFORD



Other Howards products include: Cetostearyl · Lauryl and Octyl Alcohols
Cyclohexylamine · Ethyl and Sodium Lactates · M.C.I.T · Sextol · Sextone B · Sorbitol

HOWARDS OF ILFORD LTD · ILFORD · ESSEX · Telephone: 3333 · Telegrams: Quinology, Ilford

TRW CTRA



Mystox

for **MILDEWPROOFING**
and **ROTPROOFING**
COTTON · JUTE · FLAX etc.

Mystolene

for **SHOWERPROOFING**
ALL TYPES OF CLOTH PARTICULARLY
CARBONISED AND STRONG ACID DYED
PIECES, FIBRO MIXTURES, etc.

CATOMANCE LTD. · WELWYN GARDEN CITY · HERTS



BLACK MOMENTS N°1

O

TAKE NO REPULSE,

whatever she doth say;

For, "get you gone,"

she doth not mean, "away,"

Flatter and praise,

commend, extol their graces;

Though ne'er so black,

say they have angels' faces.

That man that hath a tongue,

I say, is no man,

If with his tongue

he cannot win a woman.

(Two Gentlemen of Verona.
Act III. Sc. 2)

LOGWOOD BLACKS *really are black*

NONE BETTER FOR
NYLON AND
NYLON/WOOL MIXTURES



THE WEST INDIES CHEMICAL WORKS LTD

SALES OFFICE: 1 BRAZENNOSE ST., MANCHESTER 2. WORKS: HEMATINE, JAMAICA, B.W.I

If you use Azoics
you must try the newest

SOLUNAPTOLS

Trade

Mark

The greatest recent advance in the Azoic Colour Process

After years of experiment a perfected material
has been produced by

JOHN W. LEITCH & CO LTD

the modern pioneers in British Azoics

Trade

Mark

SOLUNAPTOLS

S
O
L
U
N
A
P
T
O
L
S

Are clean, easily handled powders
Dissolve readily in boiling water
Need no additions to the bath
Give well balanced pH conditions
Give solutions with exceptional wetting-out power
Give solutions which penetrate more perfectly
Produce dyeings which are faster to rubbing
Offer real advantages coupled with economy
Offer a considerable saving to you
Mean cleaner working and less worry

S
O
L
U
N
A
P
T
O
L
S

For samples, prices and demonstrations apply to
the Sole Manufacturers

JOHN W. LEITCH & CO LTD

MILNSBRIDGE CHEMICAL WORKS

HUDDERSFIELD

Telephone MILNSBRIDGE 189 & 190

Telegrams LEITCH MILNSBRIDGE

AGENTS for

INDIA

Khatau Valabhdas & Co
Vadgadi Bombay

SCOTLAND

Kirkpatrick & Lauder Ltd
180 Hope Street Glasgow C2

CANADA

Prescott & Co Regd
2209 Hingston Ave NDG Montreal 28 QUE

MANOFAST

for the printing of
CELLULOSE ACETATE
and Mixture Fabrics with
VAT DYE STUFFS

Consumers of textiles throughout the world are demanding increased colour fastness.

The Manofast process enables the textile printer to produce, with Vat Dyestuffs, effects which have all-round fastness properties on Cellulose Acetate, with minimum loss in tenacity of the fabrics and preservation of the characteristic handle.

Manofast operates under slightly acid conditions so that there is no saponification of the Cellulose Acetate.

Printed fabrics are stable prior to ageing or steaming and there is no marking off or bleeding during washing.

Discharge printing by this process can be effected without HALOING which in the past has been a deterrent to productions in this style.

WE SHALL BE PLEASED TO DISCUSS ANY PROBLEMS WHICH
ARISE IN THE USE OF MANOFAST AND TO OFFER TECHNICAL
SERVICE IF REQUIRED.

HARDMAN & HOLDEN LIMITED
MANOX HOUSE · MANCHESTER 10

Telephones: COLlyhurst 1551 (10 lines) Telegrams: "OXIDE", MANCHESTER

The Journal of the Society of Dyers and Colourists

(Subscription rates for non-members £4 per annum, post free)

(Abstracts section only printed on one side of paper—£1 10s 0d per annum)

NOTICE TO MEMBERS AND SUBSCRIBERS

Readers requiring *general information* regarding the Official Notices, List of Officers of the Society, etc. should consult pages 1-6 of the January 1953 and pages 229-232 of the July 1953 issues of the *Journal*, or write to *The General Secretary*, The Society of Dyers and Colourists, Dean House, 19 Piccadilly, Bradford 1, Yorkshire (Telephone Bradford 25138-9). *Editorial Communications* should be addressed to *The Editor*, at the same address.

Forthcoming Papers

The following papers have been accepted by the Publications Committee, and will appear in future issues of the *Journal*—

LECTURES

- Experiments on the Chemistry of Anthraquinone Derivatives
W. Bradley
- The Textile Trade and the Newer Fibres
F. H. Clayton
- Pressure Dyeing and Bleaching with special reference to Recent Developments
F. H. Marsh
- The Heat Setting of Terylene Polyester Filament Fabrics in relation to Dyeing and Finishing
D. N. Marvin
- Studies in the Printing of Terylene Polyester Fibre
A. G. H. Michie
- The Dyeing of Nylon Yarn in Package Form
W. S. Willson

COMMUNICATIONS

- The Dyeing of Acetate Rayon with Disperse Dyes.
- I—Aqueous Solubility and the Influence of Dispersing Agents
II—The Relation between Aqueous Solubility and Dyeing Properties
C. L. Bird
- The Effect of Dyeing on the Sorption of Water Vapour by Wool
P. Larose
- The Effect on Wool of Boiling in Aqueous Solutions.
I—Water and Solutions of Sodium Sulphate at pH 1.5-9.0
R. V. Peryman

Patents — Designs — Trade Marks
W. P. THOMPSON & CO
CHARTERED PATENT AGENTS

50 LINCOLN'S INN FIELDS
LONDON WC 2
Holborn 2174

12 CHURCH STREET
LIVERPOOL 1
Royal 3172

HYDROGEN PEROXIDE

all strengths

MANUFACTURED

BY

ALCOCK

(PEROXIDE) LTD

LUTON BEDS



AGENTS

F Brayshaw & Sons Limited Junction Mills

Laisterdyke Bradford Yorkshire

Thos Hunter & Sons

35/37 Boyne Square

Belfast N Ireland

FORTHCOMING MEETINGS OF THE SOCIETY

SCOTTISH SECTION

All Meetings in St. Enoch Hotel, Glasgow, at 7.0 p.m., unless otherwise stated

- 1954
 Tuesday F. H. Marsh, Esq. (Longclose Engineering Co. Ltd.). *Modern Developments in Dyeing Machinery*
 19th Jan.
 Tuesday LADIES' EVENING — Miss J. M. Young, B.A. (I.W.S.). *Fashion History in Wool*. Institution of Engineers and Shipbuilders, Scotland
 16th Feb. The lecture will be illustrated by a colour film strip, and a sound film *Paris, City of Fashion* will be shown also to supplement the lecture.
 Tuesday ANNUAL GENERAL MEETING OF THE SECTION.
 23rd March To be followed by three short papers by Sectional members — details to be announced later

MIDLANDS SECTION

Except when stated otherwise, Lecture Meetings commence at 7.0 p.m.

- 1954
 Wednesday J. Payne, Esq., B.Sc. *Silicon Chemicals in Textile Finishing*. College of Technology, Leicester
 20th Jan.
 Wednesday Douglas Haigh, Esq., A.T.I. *Some recent researches in the Dyeing of Felt*. Masonic Hall, Nuneaton
 24th Feb.
 Thursday R. F. Wilson, Esq. (B.C.C.) (Joint meeting with the Nottingham Textile Society). *Colour*. Gas Theatre, Nottingham
 4th March
 Wednesday G. H. Lister, Esq., B.Sc., Ph.D. *The Migration Properties of Acid and Chrome Dyes*. Victoria Station Hotel, Nottingham
 17th March
 Friday MIDLANDS SECTION DINNER. King's Head Hotel, Loughborough
 26th March
 Wednesday ANNUAL GENERAL MEETING OF SECTION.
 7th April J. A. Potter, Esq., M.A. *Dyeing and Finishing Synthetic Fibres in the Hosiery Industry*. King's Head Hotel, Loughborough

NORTHERN IRELAND SECTION

All Meetings to be held in Royal Avenue Hotel, Belfast, at 7.30 p.m.

- 1954
 Friday C. P. Tattersfield, Esq. (Courtaulds Ltd.). *Developing New Uses for Rayon*. (Joint meeting with Textile Institute)
 8th Jan.
 Friday W. Ford-Kirkpatrick, Esq. *Putting the Colour into Photography*
 5th Feb.
 Friday J. Potter, Esq. (Clayton Aniline Co. Ltd.). *Special Finishes for Textiles and Their Evaluation*. (Joint meeting with Foremen Dyers Guild)
 5th March
 Late March or early April ANNUAL GENERAL MEETING AND DINNER. (Details later)

MANCHESTER SECTION

Unless otherwise stated, meetings take place at the Textile Institute, 10 Blackfriars Street, Manchester 3, and commence at 6.30 p.m.

- 1954
 Friday S. Blackburn Esq., and M. R. Fox, Esq. (I.C.I. Ltd., Dyestuffs Divn.). *The Behaviour of Leuco Vat Dyes above 100°C.*
 15th Jan.

MANCHESTER JUNIOR BRANCH

All lectures to be held in the Reynold's Hall, Manchester College of Technology, at 6.30 p.m.

- 1954
 Monday C. L. Bird, Esq. *Theoretical Aspects of the Dyeing of Cellulose Acetate Rayon*
 1st Feb.
 Monday D. G. Evans, Esq., B.Sc. *Cibalan Dyes — Nylons and Nylon Unions*
 8th March

WEST RIDING SECTION

Meetings held at the Victoria Hotel, Bradford, at 7.15 p.m. unless otherwise stated

- 1954
 Thursday G. W. Wendon, Esq., B.Sc., Ph.D., A.R.C.S., D.I.C. (English Metal Powder Co. Ltd.). *Preparation, Use and Evaluation of Metallic Pigments*. Metropole Hotel, King Street, Leeds, at 7.15 p.m.
 14th Jan.
 Friday LADIES' EVENING
 22nd Jan.
 Thursday F. H. Marsh, Esq., B.Sc., F.R.I.C. (Longclose Engineering Co. Ltd.). *Modern Trends in the Manufacture of Dyeing Machinery with Particular Reference to High Temperature Dyeing*
 11th Feb.
 Thursday A. R. Smith, Esq., B.A., B.Sc., A.R.I.C. (British Industrial Plastics Ltd.). *The Application of Resins to Textiles*
 25th Feb. Prof. J. B. Speakman (The University, Leeds). *Lecture. Title to be announced later*
 Thursday LECTURE AND ANNUAL GENERAL MEETING
 11th March
 Thursday S. Kershaw, Esq., F.T.I. (By invitation of the Yorkshire Section of the Textile Institute). *Experiences on a United Nations Assignment*. Midland Hotel, Bradford, at 7.15 p.m.
 25th March
 Tuesday G. Kenneth Seddon, Esq. (By invitation of the Bradford Textile Society). *Interesting Points in Dyeing and Finishing*. Midland Hotel, Bradford, at 7.15 p.m.
 12th Jan.
 Monday 8th March

LONDON SECTION

All Meetings will be held at the Royal Society, Burlington House, Piccadilly, London W.1, at 6.0 p.m. unless otherwise stated

- 1954
 Thursday Dr. G. T. Douglas (I.C.I. Ltd.). *The Dyeing of Synthetic Fibres*
 7th Jan.
 Friday C. P. Tattersfield (Courtaulds Ltd.). *Dyeing and Finishing in relation to Use-Development Work*
 5th Feb.
 Friday *The London Lecture*. Subject, Speaker and venue to be given
 5th March

HUDDERSFIELD SECTION

All Lectures at Field's Cafe, Westgate, Huddersfield, at 7.30 p.m. unless otherwise stated

- 1954
 Tuesday F. Thies, Esq. (Messrs. B. Thies, Coesfeld, Germany). *High Temperature Dyeing and Pressure Drying*. To be held in Large Hall, Huddersfield Technical College
 19th Jan.
 Tuesday J. G. Grundy, Esq. (Clayton Aniline Co. Ltd.). *Cibalan Dyes and their Fastness Properties on Nylon and Application to Wool-Nylon Unions*
 16th Feb.
 Tuesday ANNUAL GENERAL MEETING, followed by a lecture, *Fastness Properties for Users Satisfaction*. J. S. Ingham, Esq. (Marks & Spencer Ltd., London)
 16th Mar.

BRADFORD JUNIOR BRANCH

All Meetings held at Bradford Technical College commencing at 7.15 p.m. unless otherwise stated

- 1954
 Tuesday Visit to Messrs. G. J. Stubley Ltd., Batley
 Afternoon
 19th January
 Thursday C. L. Bird, Esq., M.Sc., F.R.I.C. *Theoretical Aspects of the Dyeing of Cellulose Acetate*
 4th Feb. Film Evening. Mather & Platt
 Tuesday
 16th Feb. Visit to Messrs. J. Hoyle & Son Ltd., Huddersfield
 Thursday
 Afternoon
 18th Feb. Junior Branch Dance
 Thursday
 25th Feb. Students' Competition Evening
 Friday
 12th March



Solar Green 3LB

(Patent applied for)

An outstanding new introduction

The highest fastness to light of all Direct
Greens

For the dyeing of casement cloths, uphol-
stery materials, and spun rayon dress goods



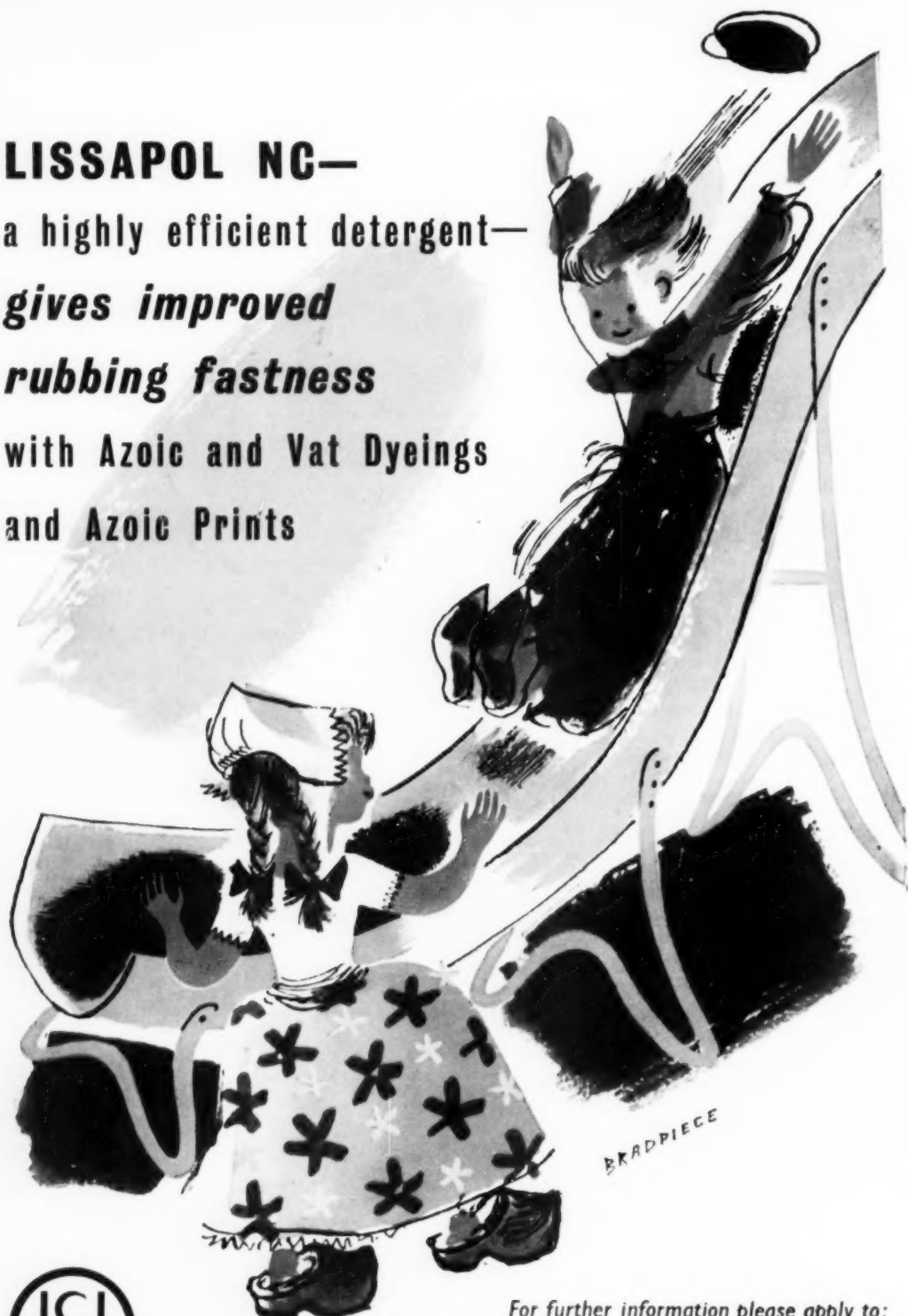
Sandoz
PRODUCTS LTD.
BRADFORD

LISSAPOL NC—

a highly efficient detergent—

***gives improved
rubbing fastness***

with Azoic and Vat Dyeings
and Azoic Prints



For further information please apply to:
IMPERIAL CHEMICAL INDUSTRIES LTD., LONDON, S.W.1

THE JOURNAL OF THE Society of Dyers and Colourists

Volume 69 Number 12

DECEMBER 1953

Issued Monthly

COMMUNICATIONS

Absorptiometric Colorimetry in the Textile Laboratory

C. H. GILES AND I. S. SHAW

This is a description of the principal uses of absorptimeters and colorimeters in a textile laboratory, including their employment for the determination of the concentrations of dyes in solution and of dyes and certain auxiliary products on the fibre, the amounts of metals present on the fibre, and the pH values of aqueous liquids. Tabulated descriptive details of current British instruments are included, and recent developments in the understanding of the relative accuracy attainable in absorptiometric analysis, and its improvement, are discussed. The paper is largely a review, but a little new investigational work has been included where necessary to supplement the published information.

Introduction

The present paper is designed to supplement an earlier one⁷, which outlined the theoretical principles of absorptiometric colorimetry. It describes practical methods of applying these principles in the types of analysis most likely to be required in a laboratory concerned with textile materials.

Absorptiometric analysis depends on the quantitative comparison of the light-transmission properties of a test sample solution against a standard solution prepared from the same constituents, and of known concentration. Any reagent can be analysed in this way even if it is not itself coloured, provided it can be brought into solution suitably as a coloured product. (Coloured products here include those absorbing strongly in the near ultraviolet region, because this comes within the range of many modern instruments.) Three main types of instrument are now in use for the purpose (Table II)—

DUBOSCQ COLORIMETER

An optical device enables the light passing through two cells, containing standard solution and test sample respectively, to be compared by eye, and the length of light path through each solution may be varied until a match is obtained.

PHOTOELECTRIC ABSORPTIOMETER

The light transmission of each solution is determined by allowing light to pass through it on to a photoelectric cell and measuring the current so generated. Filters (or a diffraction grating) are used so that light of only the most effective waveband for the analysis is used. This waveband

is that which covers most closely the maximum wavelength of absorption of the substance under test.

PHOTOELECTRIC SPECTROPHOTOMETER

This is a more elaborate instrument than the absorptiometer, the waveband selection being made by a dispersing prism of glass or quartz, and the spectrum employed usually extending some way into the ultraviolet and infrared regions.

The principles of operation of some of these instruments have already been described⁷, and that of others is given later in this paper.

Theoretical Discussion

LIGHT ABSORPTION OF SOLUTIONS

The theoretical basis of operation of all absorptiometric colorimeters is a simple law, summarising the discoveries of Bouguer (1729), Lambert (1760), and Beer (1852), which states that—

The absorption of light in passage through any medium is proportional to the number of absorbing molecules in its path.

The mathematical form of this law is written—

$$\log_{10} \frac{I_0}{I_T} = \epsilon l c (i)^*$$

where I_0 and I_T are the intensities of the light entering and leaving the medium respectively, ϵ is a constant (the "molar extinction coefficient"), l is the thickness of the absorbing medium, and c is the concentration of absorbing substance. $\log_{10} I_0/I_T$ is a convenient practical measure of absorption, and is known as the *optical density*. Absorptimeters and spectrophotometers are usually

* This law has been discovered empirically. Strong²⁷ has recently given a proof from first principles.

calibrated on a scale of optical density and/or percentage light transmission (i.e. $100I_T/I_0$)*.

The molar extinction coefficient ϵ is characteristic of each molecule at any given wavelength, and has considerable theoretical importance in the study of the relation of molecular structure to light absorption, but it is little used in analytical work. It represents the optical density of 1 cm. thickness of a medium containing 1 mole of the absorbing substance per litre. For dyes the value of ϵ at the wavelength of maximum absorption is of the order of 10^4 , and it is useful to know that an optical density of 0.3 (about 50% light absorption), a convenient value for solutions to be examined with the best accuracy on an absorptiometer (see below), is given by solutions of the order of 0.01 g./litre at 1 cm. thickness.

The law expressed by equation (i) holds universally in so far as optical density is always proportional to the thickness of the absorbing layer, but apparent anomalies often occur in the relation (usually known as Beer's law) between optical density and concentration of absorbing substance. These anomalies are due, e.g. to molecular aggregation of solutes, or to the selection of too wide a waveband in the instrument⁷.

RELATIVE ERROR IN ABSORPTIOMETRIC ANALYSIS

It is usual when first examining a substance absorptiometrically by a photoelectric instrument to prepare a graph (e.g. Fig. 1) showing the relation between concentration of absorbing substance and optical density. If Beer's law is obeyed this curve is linear, and the strengths of any solutions of the

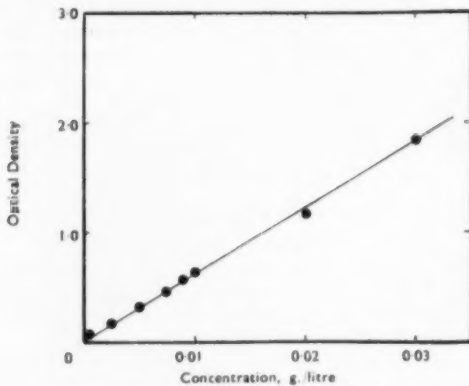


FIG. 1.—Calibration Curve (Normal Type) for Orange II (Photoelectric Spectrophotometer, λ 4820Å., 1 cm. cell)

substance may be obtained subsequently by direct comparison of their optical densities without reference to the curve. It has often been assumed that the linearity of the calibration curve indicates uniform reliability of results at any concentration within its range. This is not so. It is now known that there is an exact mathematical relation which determines that the most reliable results are actually obtained over a certain well defined range

of optical density, whether or not Beer's law is obeyed. An understanding of this fact has led to important improvements in precision in colorimetric analysis. It does not seem that this feature of the study of absorptiometric analysis has received as much attention in this country as elsewhere, though the British workers, Twyman and Lothian (1933)²⁸, appear to have been the first to draw attention to it, and to give it precise mathematical definition. Their work referred to the use of spectrophotometers. At that time absorptiometric methods had not reached the important position they now hold in the chemical laboratory. Commercial photoelectric instruments were almost unknown and the visual (Duboscq) instrument was the standard type in use; this was not normally calibrated in optical density or transmission units. Consequently Twyman and Lothian's important conclusions seem to have evoked little interest until the increasing use of photoelectric instruments caused the subject to be re-examined in later years, in Finland, Germany, and particularly in the U.S.A.*.

Two important facts must be considered in a study of the analytical accuracy attainable with photoelectric absorptiometers: (a) the photoelectric cell gives a current of a strength, which within certain limits, is proportional to the light it receives. The reading thus measures *light transmission* and not strictly optical density. The scale is usually calibrated in units of optical density only because this function is more conveniently related to concentration and thickness of the absorbing medium and thus has more practical value; (b) in absorptiometric analysis a determination of only the *relative* strength differences between individual solutions is carried out: the *absolute* strength differences will vary as the solutions are diluted to suit the instrument. It follows that for the maximum accuracy of analysis to be achieved a given *relative strength difference* between any two solutions must produce the *maximum change in light transmission*.

If, therefore, in plotting the calibration curve for a series of solutions, concentrations are plotted on a logarithmic scale, so that equal divisions represent equal relative concentration changes, and the instrument readings are plotted as percentage transmission values, a true picture can be obtained of the variation in accuracy of measurement with change in transmission. This method of plotting, suggested by Ringbom²⁹, is shown in Fig. 2(a) for solutions of Orange II examined on a photoelectric spectrophotometer in this laboratory. It is evident that the slope of the curve is a measure of the analytical accuracy, for it is a measure of the instrument response given by a change in relative concentration.

It can be shown, in fact (see Appendix), that the analysis error is at a minimum when $\log_{10} I_0/I_T$,

* See e.g. Hogness, *et al.*¹², Ringbom²⁹, Schleicher²⁴. A useful review of the subject is given by Ayres¹.

The investigation into the accuracy of colorimetric instruments reported by Davis, Giles, and Vickerstaff⁶ was concerned with the reproducibility of individual readings on different instruments. The study of "relative error" is concerned with the accuracy with which the instrument readings can be interpreted in terms of the concentration of test substance. These two methods of examining results are complementary but not identical.

* In one-cell photoelectric absorptiometers a logarithmic galvanometer scale is usually read. The reading may be considered proportional to optical density.

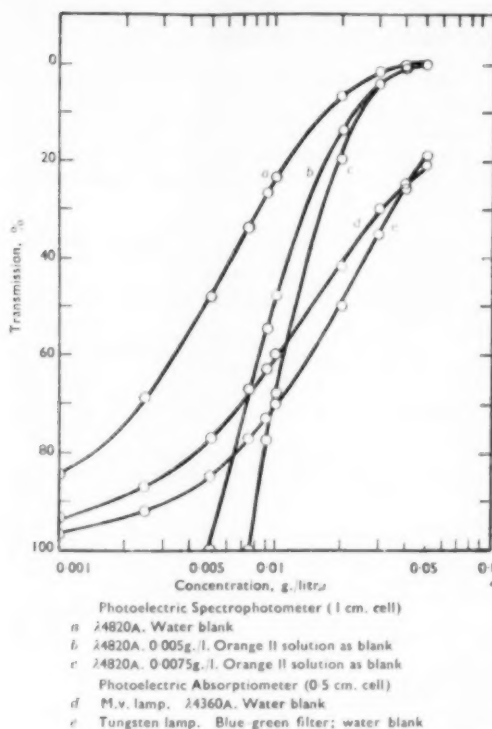


Fig. 2—Calibration Curves for Orange II Plotted to show Variation of Relative Analysis Error

the optical density, is 0.4343 (corresponding to 36.8% transmission). The relative analysis errors at other optical densities, given by Ayres¹, are shown in Table I.

TABLE I
Variation of Analysis Error with Optical Density

Optical Density	Transmission (%)	Relative analysis Error (%) per 1% Instrumental Error
0.022	95	20.8
0.046	90	10.7
0.097	80	5.6
0.155	70	4.0
0.222	60	3.3
0.301	50	2.9
0.398	40	2.7
0.523	30	2.8
0.699	20	3.2
1.000	10	4.3
1.301	5	6.5

It is thus seen both from the above table and from Fig. 2 that to achieve the best analytical result solutions should be diluted to give densities within the range of about 0.2-0.7. Outside this range, particularly at very low or very high values, the accuracy falls off considerably.

The general form of the curve remains the same for all materials which obey Beer's law, variations in concentration or depth of absorbing material producing only a displacement of the entire curve along the concentration axis (cf. Fig. 2 (a), (d), (e)).

If the system does not obey Beer's law, the inflection occurs at a different value of transmission (cf. Fig. 2 (d), (e)).

"PRECISION" ABSORPTIOMETRIC ANALYSIS

The modern photoelectric spectrometers can readily be used for absorptiometric analysis in place of the simpler absorptimeters. By applying to their use the theory of relative error it is found that a considerable increase in analytical accuracy can be achieved, in some cases a precision as high as 1 in 1000 being attained, a gain of about ten times compared with the normal methods. The basis of the application is that in place of the usual solute reference blank, one of a known solution of the substance under test is used, of concentration very close to the unknown. When using a spectrophotometer in this way, the slit is first opened up, with the coloured "blank" in place, until the indicator galvanometer reads 100% transmission. A study of curves (a), (b), and (c) of Fig. 2 will show that by this means, a much higher ratio of change in instrument reading to change in concentration is obtained. Curves (b) and (c) were obtained with the same dye solution as curve (a), but coloured "blanks" of two different concentrations were used.

Amongst those who have described this so-called "differential" method of analysis in detail, theoretically and in its practical application, are—Bastian², Bastian, Weberling, and Palilla³, Hiskey¹⁰, Robinson²¹, Hiskey and Firestone¹¹ (who discuss the application to multicomponent systems), and Young and Hiskey²².

This technique does not seem to be applicable to photoelectric absorptimeters, except possibly with the use of mercury-vapour (monochromatic) illumination, because of the limited means of illumination control they incorporate, but one application of the theory to their use has been discussed by Ayres¹ and others. This applies in the case of solutions which give optical density readings above the desirable range when used with the normal filter (i.e. the one giving the highest reading) and which it may be undesirable or impracticable to dilute. The necessary reduction in optical density reading to achieve maximum precision may then be produced by departing from the normal practice and using a filter giving a lower reading, i.e. one not covering the absorption maximum of the solution.

Apparatus

The principles of operation of the Duboseq colorimeter and of the common types of photoelectric absorptimeter have already been given.

CONTINUOUS-RECORD INSTRUMENTS

Laboratory-constructed instruments for continuous recording of colour changes in circulating liquors were described earlier⁷. Three commercial instruments of this type are now manufactured in this country. Two, made by Baird & Tatlock Ltd. and included in Table II, are designed for process control work in the chemical industry, and these could no doubt be used, if required, for recording changes in concentration of the bath during dyeing

operations. The third instrument is made by Bell Bros. Ltd., specifically for determining the residual chlorine content of mains water.

The principle of operation of the B.T.L. instrument is shown by Fig. 3. Two hermetically sealed absorption cells are incorporated. The liquid under examination flows through one cell and a liquid used as a reference standard through

The lamp operates at a voltage considerably less than its rated figure, to ensure long life.

THE PHOTOELECTRIC SPECTROPHOTOMETER

The photoelectric spectrophotometer is now becoming increasingly used, and a brief outline of its principle of operation may be of interest. The first instrument of this type was described by

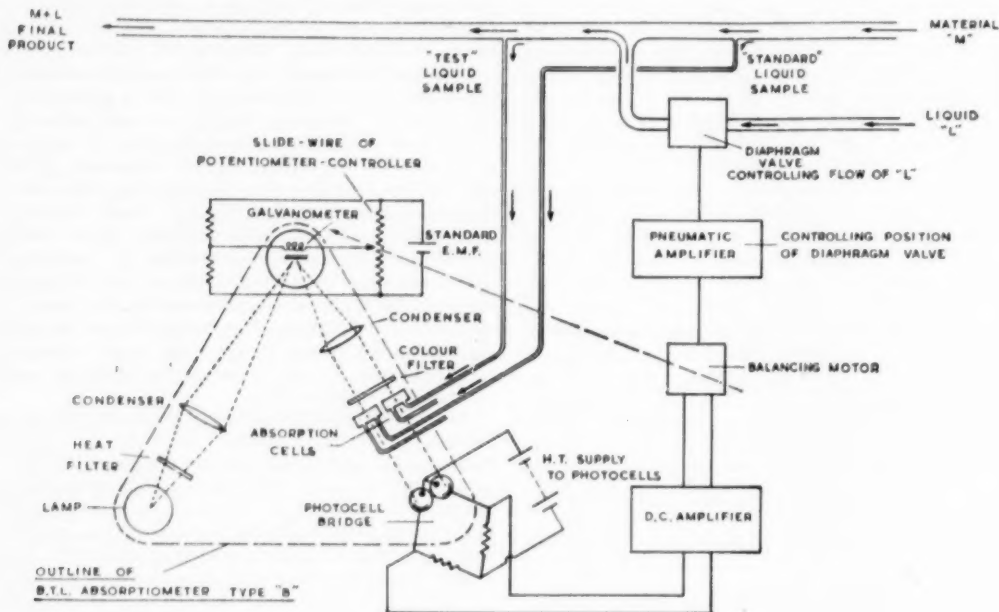


DIAGRAM OF TYPICAL APPLICATION OF B.T.L. ABSORPTIOMETER, TYPE "B"

FIG. 3

the other. Any change in the amount of light falling on one photocell, due to variation in absorption of the liquid under test, causes an out-of-balance e.m.f. from the photocell network to be applied to the amplifier incorporated in the instrument. The amplified e.m.f. is applied to the mirror galvanometer, which turns the light beam so as to increase or decrease the area of illumination on the photocell affected by the variation and thus bring the amount of light falling on this photocell to equality with that on the other, which has not been affected. The photocells are thus kept evenly illuminated, thereby automatically compensating for changes in lamp intensity due to voltage fluctuations. The galvanometer current, which is proportional to the change in the amount of light absorbed in the liquid under test, is registered either by a dial millimeter or by a continuous recording instrument.

Cary and Beckman⁴, and the optical system employed is shown schematically in Fig. 4.

An image of the light source *A* is focused by the condensing mirror *B* and diagonal mirror *C* on the entrance slit at *D*. The entrance slit is the lower of two slits placed vertically over each other. Light falling on the collimating mirror *E* is rendered parallel and reflected toward the quartz prism *F*. The back surface of the prism is aluminized so that light refracted at the first surface is reflected back through the prism, undergoing further refraction as it emerges from the prism. The collimating mirror focuses the

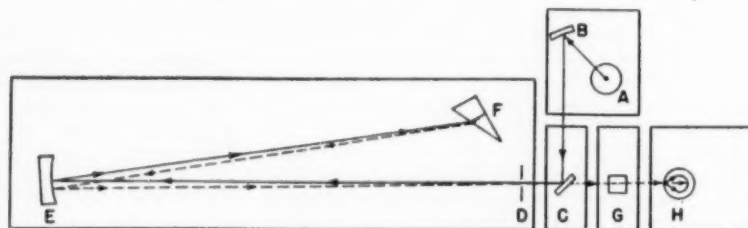


FIG. 4—Schematic Diagram of Optical System of Beckman Spectrophotometer

TABLE II
Absorptimeters and Colorimeters Manufactured in Great Britain (1953)

A—VISUAL COLORIMETERS—DUBOSCQ TYPE

Name	Manufacturer	Cups	Characteristics	Illumination
Crista	Hawkesley & Sons Ltd.	Micro and normal size are available	Vernier to 0.1 mm.	Direct mains-operated 25 w. tungsten lamp, with blue glass filter. Alternatively by reflected daylight.
Microptic	Hilger & Watts Ltd.	Capacities range from 2-10 c.c.	Direct, reading to 0.2 mm. (0.02 mm. by est.) by microscope	Direct mains-operated 25 w. tungsten lamp.
Utilux	J. Swift & Son Ltd.		Vernier, to 0.1 mm.	Direct mains-operated 25 w. tungsten lamp.

B—PHOTOELECTRIC ABSORPTIMETERS AND SPECTROPHOTOMETERS

Name	Manufacturer	Photo-cells	Type	Illumination varied by	Illuminant (tungsten lamp unless otherwise stated)	Waveband selection by	Optical cells	Power supply	Method of reading
Self-balancing p.e. absorptiometer, Types A and B*	Baird & Tatlock	2	e	Automatic control	250 v., 100 w.	Gel. filter (if required)	6 mm. and 22 mm. continuous flow types	m.	Indicating or recording millimeter
EEL portable colorimeter	Evans Electro-selenium	1	b.l.	Wheel-operated shutter	2.5 v., 0.3 amp.	Range of 8 gel. filters	16 mm. diam. glass tubes; also 8 and 12 mm. tubes used with adapters	by. or m.	galvo. log.
EEL absorptiometer	Evans Electro-selenium	1	b.l.	Wheel-operated shutter	12 v., 36 w.	Rotating disc of 9 narrow-cut gel. filters	Rectangular fused glass cells 2.5, 5, 10, 20, 40, 100 mm.	by. or m.	galvo., o.d. and % trans.
Gallenkamp photoelectric colorimeter	Gallenkamp	1	b.l.	Coarse: rheostat. Fine: lamp-p.e. cell distance adjustment	6.2 v., 0.3 amp.	Range of 8 gel. filters	10 mm. diam. glass tubes	by. or m.	galvo. log.
Clinical photoelectric colorimeter	Gambrell Bros.	1	b.l.	Electrical resistance network	2 v., 1.3 w.	Red, green and blue filters	Test tubes or rectangular cells	by. or m.	galvo. log.
Biochem absorptiometer	Hilger & Watts	1	b.l.	Wheel-operated shutter	4 v. 3 w. (pre-focus)	Rotating disc of 8 gel. filters	Rectangular fused glass cells 1, 1.2, 4 cm. or test tubes†	by. or m.	Integral, mirror-spot galvo.
Spekker absorptiometer (H 760)	Hilger & Watts	2	b.l. in balancing bridge circuit	Dial-operated logarithmic shutter	250 v., 100 w. projection lamp; interchangeable with m.v. lamp, 200-250 v., 125 w.	Range of 8 11ford narrow-cut gel. Spectrum filters. Range of glass and gel. filters for separating n.v. lines	Rectangular fused glass cells 1, 1.2, 4 cm.; and 1 cm. microcells	m.	By drum, o.d. units (lin.-spaced) or % trans.
Spekker absorptiometer (H 675) (long-cell model)	Hilger & Watts	2	b.l. in balancing bridge circuit	Dial-operated logarithmic shutter	12 v., 100 w.	Range of 8 11ford narrow-cut gel. Spectrum filters. Range of glass and gel. filters for separating n.v. lines	20 cm.	m.	By drum, o.d. units (lin.-spaced) or % trans.
Spekker Fluorimeter (H 760)‡	Hilger & Watts	2	b.l. in balancing bridge circuit	Dial-operated logarithmic shutter	m.v., 200-250 v., 125 w.	Range of glass and gel. filters	20 cm.	m.	Reflecting galvo. with separate lamp and scale
Uvispek photoelectric spectrophotometer	Hilger & Watts	2	e	Mechanical control of slit width	20 v., 8 w. for low and 12 v., 36 w. for high densities; hydrogen discharge lamp for u.v. region	Dial-operated interchangeable glass or quartz prism Littrow monochromator. Average band-spread, 10 Å.	Rectangular fused glass or silica cells 1, 5, 10, 20, 40 mm.	m.	Dial; o.d. and % trans.
G.P. photoelectric colorimeter (S.P.300)	Unicam Instruments (Cambridge)	1	b.l.	Galvo. control	6 v., 0.3 amp.	Red, green and blue 11ford gel. filters	Rectangular fused glass cells 10 mm.	by. or m.	Integral mirror spot galvo with lin. or log. scale
D.G. spectrophotometer (S.P.350)	Unicam Instruments (Cambridge)	1	b.l.	Galvo. control	12 v., 24 w., pre-set exciter type	Dial-operated diffraction grating with monochromator slit. Band width, 350 Å.	Rectangular fused glass cells 10 mm. or with 1, 1.2, 5, 10, 20, 30 or 40 mm. test tubes	by. or m.	Integral mirror spot galvo with lin. or log. scale
P.E. quartz spectro-photometer (S.P.500)	Unicam Instruments (Cambridge)	2 e. For 2000-6500 Å. and 5500-10,000 Å. ranges, respectively with amplifier		Mechanical control of slit width	6 v., 36 w. tungsten; 200 v., 40 w., hydrogen discharge lamp for u.v. region	Dial-operated quartz prism Littrow monochromator range 2000-10,000 Å.	Rectangular fused glass or silica cells 2, 5, 10, 20, 30, 40 mm.	by. and m.	Dial; o.d. and % trans. units
Spectrophotometer (S.P.600)	Unicam Instruments (Cambridge)	2 e. For use above and below 6500 Å.		Mechanical control of slit width		Dial-operated glass prism Littrow monochromator, range 3600-10,000 Å. Band width 30-100 Å.	Rectangular fused glass cells 1, 2, 5, 10, 20, 30 or 40 mm.	by. or m.	Dial; o.d. and % trans. units

Abbreviations

b.l. = barrier layer; e = emission; by. = battery; galvo. = galvanometer; gel. = gelatin; log. = logarithmic scale; lin. = linear scale; m = a.c. mains; m.v. = mercury vapour; o.d. = optical density; trans. = transmission.

* Type A is self-contained; Type B is designed to operate in conjunction with a self-balancing Honeywell Brown potentiometer-recorder.

† The holder for test tube cells incorporates an optical compensating device to prevent the instrument readings from being affected by variations in refractive index of the test liquids. The light beam enters and leaves the tube radially.

‡ This model can be converted interchangeably to an absorptiometer for use with the m.v. or tungsten lamp.

§ The most recent model (November 1953) incorporates a photomultiplier cell to raise the sensitivity.

** The term *photoelectric cells* now recommended in place of "barrier-layer cell" (see B.S. 233:1953).

plastics, whose colour content may also require to be known. Examples are given in Table III.

TABLE III

Fibre or Plastic	Solvent
Acetate rayon	Acetone
Cellulose	Sulphuric acid-water mixture
Nylon	<i>m</i> -Cresol or a 20% solution of phenol in benzene
Orlon	Dimethylformamide
"Perspex"	Acetone, chloroform, toluene, etc.
Polystyrene	Dioxan
Polyvinyl chloride	<i>cyclo</i> Hexanone
Polyvinylidene chloride	Dioxan
Polythene	Toluene, xylene
Protein fibres	Aqueous sodium hydroxide solution
Terylene	<i>m</i> -Cresol
Vinyon	Acetone

Fuller details are given in the Experimental Section.

Fibre Extraction

Several suitable solvents are available for extracting dyes from the fibre. For details see the Experimental Section below.

Fibre Blends

Measurement of dye concentration on a fibre can be made on samples of unknown origin, if the identity of the colouring matter can first be

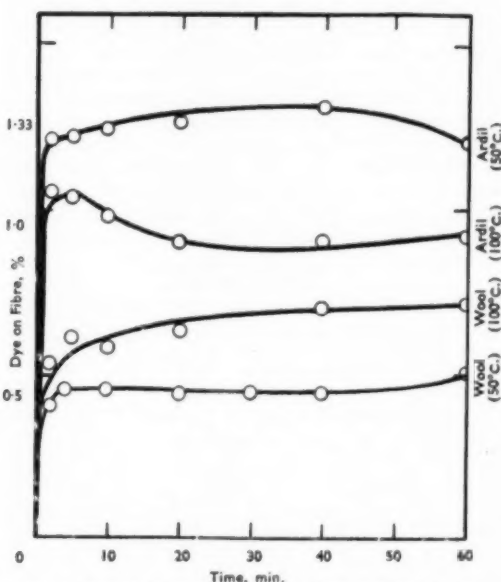


FIG. 6—Rate of Dyeing of Ardil-Wool Blends at 50 and 100°C. (100 vol. baths. 2% Orange II).

determined, but the principal value of the general method is likely to be in the measurement of rate of take-up of a known dye by different fibres in a blend; in this case, of course, the measurement of dye bath concentration is useless. The fibre varieties must, necessarily, be separated before

dissolution, and if they are present as blended yarn this requires care. In some cases it may be done by hand, because on account of the sensitivity of the absorptiometer, quite a small quantity is sufficient, say 0.001 g. minimum (based on a 1% dyeing), but preferably more, for accuracy in weighing. A better method is separation by flotation in a solvent of specific gravity intermediate between that of the fibres in the blend. Details are given in the Experimental Section below. Unfortunately this method cannot be used for blends of wool and "Ardil" fibre (ICI), which may often require to be examined, because these have identical specific gravity.

Fig. 6 shows rate-of-dyeing curves of a blend of wool and Ardil fibre, determined by the dissolution procedure, after manual separation of the fibres.

(IV) DETERMINATION OF CERTAIN AUXILIARY PRODUCTS ON THE FIBRE

We find that the concentration of a fluorescent bleaching agent on the fibre may be determined exactly as for a dye on the same fibre, the solution being determined by ultraviolet radiation in a photoelectric instrument.

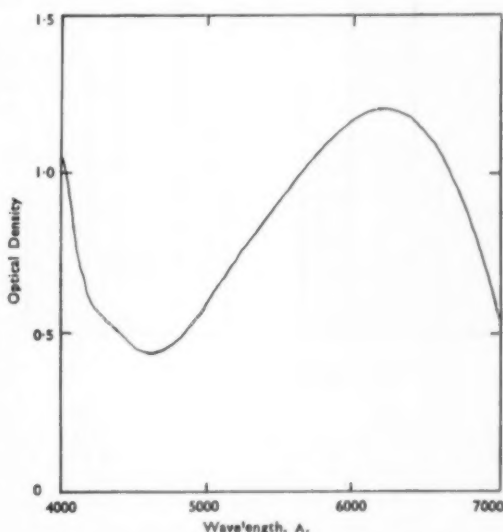


FIG. 7—Water-soluble Chromium Lake of Hematoxylin (arbitrary concentration, 1 cm. cell)

Absorptiometric methods for the determination of mothproofing agents on wool have recently been described by Hartley, Elsworth, Midgley, and Barritt⁹. The brownish coloured chloroform solution obtained by shaking this solvent with a mixture of copper sulphate solution and a pyridine extract of wool treated with Eulan CN or Lanoc CN may be measured absorptiometrically. Another method, applicable also to Mitin FF, is based on absorptiometric measurement of the Methylene Blue complex extracted by chloroform from either a pyridine extract containing sulphuric acid or a sulphuric acid digest of the treated wool.

(V) DETERMINATION OF METALS

Clayton⁵ has described methods of removal from the fibre and qualitative tests for the metals, including chromium, most likely to be present in textile materials. Much information is also available upon the separation and quantitative absorptiometric analysis of these metals (see e.g. Sandell²², Snell and Snell²⁶, Vogel³⁰, and Yoe³¹). One of the best-known colorimetric reagents for chromium is diphenylcarbazide. It has been found in this laboratory that this metal may also be readily determined by means of the deep blue water-soluble lake which it forms with 2 mols. of hæmatoxylin. The reagent is commercially available in a pure state, and it has been used previously (Sandell²²) for determining aluminium, but apparently not for chromium. Fig. 7 shows a light absorption curve of the chromium lake.

(VI) DETERMINATION OF pH VALUES

Modified Duboscq-type colorimeters were formerly used for determining pH values by indicators. These had the usual fixed plungers

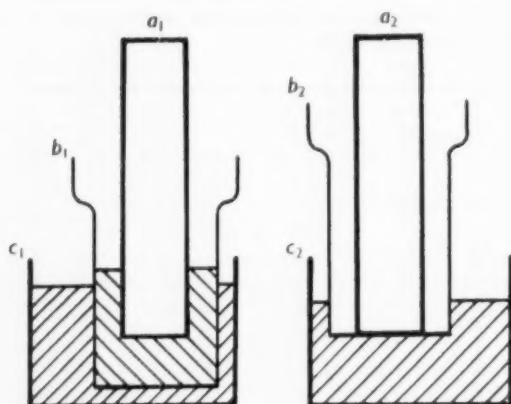


FIG. 8.—Modified Duboscq Colorimeter for Determination of pH Values

(a_1 , a_2 , Fig. 8), with two pairs of movable cups (b_1 , b_2 ; c_1 , c_2), arranged as shown. In use, the test solution with indicator would be placed, e.g. in c_2 with b_2 brought right up into contact with a_2 ; b_1 , c_1 would contain blank indicator solution of the same strength as in the test sample, but brought separately to the acid and alkaline forms. Cup b_1 alone is moved until a colour match is obtained. The total depth of liquid on the two sides thus remains constant, but the proportions of the acid and alkaline form of the indicator in the left-hand light path varies. Tables were used (see, e.g. Snell and Snell) to determine the pH value of the test solution from the ratios of the indicator forms at the match point.

pH values can also be determined quite readily by a photoelectric absorptiometer. Lothian¹⁶, using a number of common indicators with the Hilger Spekker instrument, showed that by employing the appropriate filter covering the peak waveband of one form of the indicator, and

solutions of indicator of fixed concentration in various buffer mixtures, calibration curves of optical density—pH value can readily be obtained. The pH value of a solution could be determined with the mean precision figures shown in Table IV—

TABLE IV
Absorptiometric Determination of pH Value (Lothian)

Indicator	Nominal pH Range	Mean Precision of Determination pH Units
Thymol Blue	1.2-2.3	0.02
Bromophenol blue	2.8-4.4	0.04
Methyl red	4.0-6.4	0.04
Bromocresol purple	5.2-6.8	0.02
Bromothymol blue	6.0-7.6	0.02
Phenol red	6.8-8.4	0.02
Cresol red	7.2-8.8	0.02
Thymol blue	8.0-9.6	0.03

This method is suitable for coloured solutions also. By working with narrower transmission bands, as can be done with modern photoelectric spectrophotometers, these precision figures could be still further improved.

Simon²⁵ has drawn attention to the method in a recent communication describing the colorimetric measurement of pH values of highly alkaline solutions (pH > 12.5) (which cannot be reliably measured on the normal glass electrode). Of several dyes examined for the purpose, Tropaeolin O (C.I. No. 148) and Parazo Orange were found to be the most satisfactory, and their light transmission curves showed regular change over a limited pH range. Using a filter absorbing light of < 4900 Å, the transmission of solutions of these dyes measured absorptiometrically could be calibrated to read pH value within the range of ca. 12.40–13.50. It is emphasised that the method is extremely sensitive to dye concentration, which must therefore be identical in both test sample and calibration standard.

Experimental

Adequate information upon the operation of the various instruments is given by the respective manufacturers and no details need be given here.

NESSLER TUBES

If these are used filled to the 100 c.c. level, dye solutions of about 0.01 g. litre should be employed. In one tube 100 c.c. of a known solution diluted to a concentration c is placed, and in the other 90 c.c. of pure solvent. Successive small quantities of the solution to be measured, diluted to a concentration about 10 c , are added to the second tube from a burette, until the solutions in the tubes appear of equal strength. They should be examined by viewing vertically downwards when held several inches in the air above evenly illuminated white paper.

FIBRE DISSOLUTION

A blank solution of undyed fibre should always be included as control in the absorptiometer. Details of some dissolution methods are as follows

(Usually dissolution is effected by warming 1 g. of the fibre in about 100 c.c. of the solvent).

Cellulose

Rowe and Levin's method²² is used. One gram of cellulose is placed in a mixture of sulphuric acid (80 c.c., S.G. 1.84) and water (20 c.c.) and allowed to stand in the refrigerator until dissolution is complete (12–24 hr.). The solution may then be measured direct on the absorptiometer or, if necessary, after dilution with more of the solvent*.

Protein Fibres

Complete dissolution may be obtained in boiling aqueous sodium hydroxide solution. Lemin and Rattee¹⁴ briefly mention the use of this method for wool, without details. We find that it gives satisfactory results with representative dyes of the acid levelling, milling, chrome mordant, and pre-metallised classes, but on account of the turbidity of the solutions, it is usually preferable to work with pyridine extracts of the alkaline wool-dye solution. If the dye does not transfer to a pyridine layer, as some mordant dyes do not, the alkaline liquor must be measured direct, against a blank wool solution. No decomposition of dye under the conditions recommended below has been detected, except of Azo Geranine 2G (C.I. No. 31) and even here the progressive colour change observed (presumably evidence of hydrolysis of the acetyl-group in the dye) was complete in a few minutes.

Boil the fibre for 2 min. in 30 times its weight of aqueous sodium hydroxide solution (10% wt./vol.), then cool the solution and shake with successive quantities of pyridine until all the dye is extracted from the aqueous layer. Finally dilute the pyridine solution with pyridine and water to give a suitable dye concentration in 25% aqueous pyridine. Manufactured protein fibres (e.g. Ardil) are more difficult to dissolve and may require a longer period of boiling in the alkaline solution.

EXTRACTION OF DYE FROM FIBRE

Vickerstaff²⁹ has described various methods of solvent extraction, including the use of: pyridine or pyridine-water (25 : 75 or 50 : 50) mixtures for acid dyes on wool; the same treatment for chrome dyes on this fibre, after the dye lake has been broken down by oxalic acid treatment; alcohol for basic dyes on wool; *o*-chlorophenol for indigoid vat dyes on wool; aqueous pyridine for direct dyes on cotton; chloroform, Cellosolve (ethylene glycol monoethyl ether), etc., for azoic dyes on cellulose†; and Abramovitch's method for extracting vat dyes from cellulose, which involves two successive treatments in 200 times (the fibre) weight of 50% aqueous Cellosolve containing 1% sodium hydrosulphite and 0.3% sodium hydroxide, at 70–75°C. for 90 min.

* Osipova and Baklins¹⁸ recommend about tenfold dilution with water containing Pregel O or gelatin, to yield a stable dispersion.
† Trichloroethylene (Triklone) would probably be very effective for this purpose.

SEPARATION OF FIBRES BY FLOTATION

The density gradient method of Mhatre and Tawde¹⁷, based on earlier work by Preston and Nimkar¹⁹ and Larose¹³, is used. Carbon tetrachloride and xylene are employed as the flotation agents, since mixtures of these liquids cover the density range of almost all fibres, and the two can readily be separated by fractional distillation after use. A mixture of the two liquids is prepared in a suitable proportion to have a density intermediate between that of the two fibres to be separated. The specific gravity of the mixture bears a linear relation to the volume fraction and at 20°C. is given by the equation:

$$\text{Sp. gr.} = 0.863 + 0.731 V$$

where V is the volume fraction of carbon tetrachloride. Table V gives specific gravity values for some of the better known fibres^{17,19}.

Under the conditions normally used even "solvent-soluble" dyes do not bleed out appreciably. If, however, any bleeding should occur in these solvents, an aqueous flotation liquid might be used instead. Saturated aqueous solutions of sodium thiosulphate with added potassium iodide, which can be used for specific gravities up to ca. 1.7, have been suggested³⁰.

TABLE V

Fibre	Specific Gravity
Nylon	1.14
Orlon (staple fibre)	
Orlon (cont. fil.)	1.17
Vinyon N, dynel	1.28–1.30
Casein fibres	1.29–1.30
Wool	1.30–1.31
Ardil fibre	1.31
Acetate rayon	1.31
Tussah silk	1.32
Acetate rayon (TiO ₂ -delustred)	1.33
Silk	1.34
Vinyon	1.35–1.37
Terylene	1.39
Jute	1.48
Viscose rayon	1.52
Cotton	1.55
Ramie	1.55
Saran	1.72
Calcium alginate	1.72
Glass, asbestos	2.5

The present authors have described* a simplified version (Fig. 9) of Mhatre and Tawde's separation tube. The liquid mixture is placed in the main tube, the fibres (previously boiled in a little carbon tetrachloride to expel air) are introduced and allowed to separate by flotation, and the floating layer run off at the side arm by gently introducing carbon tetrachloride from the separating funnel.

ANALYSIS OF CHROMIUM BY HÆMATOXYLIN

The metal is brought into solution as the chromate, e.g. by ashing the fibre as described by Clayton⁵, and to the liquid, which should be approximately neutral in reaction, there is added an aqueous solution of hæmatoxylin (1%) (2 mol. + slight excess). The mixture is boiled for about 1 min. to complete the lake formation and diluted

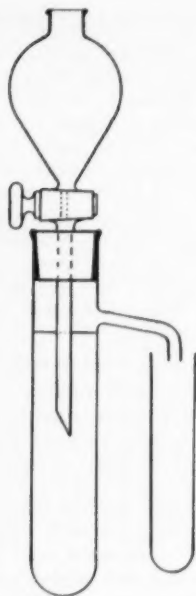


FIG. 9—Apparatus for Separation of Fibre Blends by Flotation

suitably for measurement. The lake tends to precipitate out of solution if left to stand more than a few hours. No investigations have been made into the possible interference of other metals with the analysis, though it has been found that iron and copper give insoluble lakes under the conditions used for chromium.

Appendix

Twyman and Lothian's proof²⁸ is as follows—

The condition for greatest accuracy in absorption measurements is that the percentage accuracy in measurement of optical density D shall be a maximum, i.e. that AD/D shall be a minimum, where AD is the smallest detectable change; but—

$$D = \log_{10} \frac{I_0}{I_T}$$

and hence by differentiation—

$$\begin{aligned} AD &= -\log_{10} e \frac{AI_T}{I_T} \\ \therefore \frac{AD}{D} &= -\frac{\log_{10} e}{I_T D} AI_T \\ &= -\frac{\log_{10} e}{I_0 D 10^{-D}} AI_T \end{aligned}$$

the best value of D is therefore when $D \cdot 10^{-D}$ is a maximum; by differentiation and equating to zero we get—

$$D = \frac{1}{\log_{10} 10} = 0.4343$$

The general equation of the type of curve shown in Fig. 2 is¹—

$$\frac{dc}{c} = -\frac{dI_T}{I_T} \frac{0.4343}{\log \frac{I_0}{I_T}}$$

where c is the concentration of absorbing substance.

* * *

We wish to express our thanks to Dr. A. B. Crawford for helpful discussions, to Professor P. D. Ritchie for his unfailing encouragement and interest, to the British Scientific Instrument Research Association, to the Textile Institute for permission to reproduce Fig. 9; to the following firms who have kindly supplied materials used in the experimental work—British Celanese Ltd., British Dyewood Co. Ltd., British Nylon Spinners Ltd., BX Plastics Ltd., Clark and Struthers Ltd., Clayton Aniline Co. Ltd., Courtaulds Ltd., Dow and Frame Ltd., the Geigy Co. Ltd., L. B. Holliday Ltd., Imperial Chemical Industries Ltd. (Dyestuffs Division, Nobel Division and Terylene Council), John Smith (Field Head) Ltd.; and to the following firms who have supplied information and/or have loaned blocks for illustrations—Baird and Tatlock Ltd., London, E.C.1; Beckman Instruments Inc., National Technical Laboratories, South Pasadena, Cal., U.S.A.; Bell Bros. (Manchester 1927) Ltd., Denton; Evans Electro-selenium Ltd., Harlow, Essex; Gambrell Bros. and Co. Ltd., Croydon; A. Gallenkamp and Co. Ltd., London, E.C.2.; Hawksley & Sons Ltd., London, W.1; Hilger & Watts Ltd., London, N.W.1; James Swift & Son Ltd., London, W.1; and Unicam Instruments (Cambridge) Ltd.

COLOUR CHEMISTRY RESEARCH LABORATORY
DEPARTMENT OF TECHNICAL CHEMISTRY
ROYAL TECHNICAL COLLEGE
GLASGOW C.1

(Received 21st April 1953)

Note added in proof

The Glossary of Terms used in Illumination and Photometry* should be referred to for definitions of technical terms used in absorptiometric colorimetry.

* British Standards Institution, B.S. 233:1953.

References

- ¹ Ayres, *Anal. Chem.*, **21**, 652 (1949).
- ² Bastian, *ibid.*, **21**, 972 (1949).
- ³ Bastian, Weberling, and Palilla, *ibid.*, **22**, 160 (1950).
- ⁴ Cary and Beckman, *J. Optical Soc. Amer.*, **31**, 682 (1941).
- ⁵ Clayton, *Identification of Dyes on Textile Fibres, and Detection of Metals in Fibrous Materials, Dyes and Organic Pigments* (Bradford: Society of Dyers and Colourists, 2nd ed., 1946).
- ⁶ Davies, Giles, and Vickerstaff, *J.S.D.C.*, **63**, 80 (1947).
- ⁷ Giles, *ibid.*, **66**, 615 (1950).
- ⁸ Giles and Shaw, *J. Textile Inst.*, **44**, T 406 (Aug.-Sept. 1953).
- ⁹ Gordon, Private communication.
- ¹⁰ Hartley, Elsworth, Midgley, and Barritt, *J.S.D.C.*, **68**, 171 (1952).
- ¹¹ Hiskey, *Anal. Chem.*, **21**, 1440 (1949); **22**, 503 (1950).
- ¹² Hiskey and Firestone, *ibid.*, **24**, 342 (1952).
- ¹³ Hogness, Zscheile, and Sidwell, *J. Phys. Chem.*, **41**, 379 (1937).
- ¹⁴ Larose, *Canadian J. Res.*, **B16**, 61 (1938).
- ¹⁵ Lemin and Rattee, *J.S.D.C.*, **65**, 217 (1949).
- ¹⁶ Lemin, Vickers, and Vickerstaff, *ibid.*, **62**, 132 (1946).
- ¹⁷ Lothian, *Trans. Faraday Soc.*, **33**, 1239 (1937).
- ¹⁸ Mhatre and Tawde, *J. Textile Inst.*, **44**, T70 (1953).
- ¹⁹ Osipova and Rakhina, *Tekstil Prom.*, **8**, (8), 28 (1948); through *J.S.D.C.*, **65**, 467 (1949).
- ²⁰ Preston and Nimkar, *J. Textile Inst.*, **41**, T446 (1950).
- ²¹ Ringbon, *Zeit. anal. Chem.*, **115**, 332 (1939).

- ²¹ Robinson, *Anal. Chem.*, **23**, 273 (1951); **24**, 619 (1952).
²² Rowe and LeVine, *J.S.D.C.*, **40**, 218 (1924).
²³ Sandell, *Colorimetric Determination of Traces of Metals* (New York: Interscience Publishers Inc., 1944).
²⁴ Schleicher, *Zeit. anal. Chem.*, **125**, 385 (1943).
²⁵ Simon, *Anal. Chem.*, **24**, 1215 (1952).
²⁶ Snell, F. D., and Snell, C. T., *Colorimetric Methods of Analysis*, Volume 1 (New York: D. Van Nostrand Co. Inc., 3rd edition 1948).
²⁷ Strong, *Anal. Chem.*, **24**, 338 (1952).
²⁸ Twyman and Lothian, *Proc. Phys. Soc.*, **45**, 643 (1933).
²⁹ Vickerstaff, *The Physical Chemistry of Dyeing* (London and Edinburgh: Oliver & Boyd Ltd., 1950).
³⁰ Vogel, *A Textbook of Quantitative Inorganic Analysis* (London: Longmans, Green & Co., 2nd Ed. 1951).
³¹ Yoe, *Photometric Chemical Analysis* (New York: J. Wiley & Sons, 1928).
³² Young and Hickey, *Anal. Chem.*, **23**, 506 (1951).

The Reaction between Wool and Nickelammonium Hydroxide

II—The Supercontraction of Wool Fibres in Solutions of Nickelammonium Hydroxide

J. W. BELL AND C. S. WHEWELL

When wool is immersed in solutions of nickelammonium hydroxide, nickel is adsorbed and the fibres contract in length. It is shown that the adsorption of only about 7% of nickel can induce a contraction of 40%; on removing the nickel by immersing the fibre in dilute acid it partly regains its original length. This reversal is, however, not solely dependent on removal of nickel, for if this is removed by buffer solutions of low acidity no recovery in length takes place. With the exception of acetylation, chemical modification of the wool has little or no effect on the ultimate supercontraction, but profoundly alters the recovery characteristics when the nickel is removed by acid. In general, chemically modified fibres do not recover their original length, the exception being those in which the disulphide bond is replaced by the lanthionine linkage. The improved reversibility of these fibres suggests that the disulphide cross-links play an important part in the recovery of fibres whose molecular structure has been distorted through combination with nickel.

An account of the adsorption of nickel by wool from solutions of nickelammonium hydroxide was given in Part I¹; Part II is concerned with the dimensional changes in the fibre which accompany this reaction.

Experimental

PREPARATION AND ANALYSIS OF REAGENTS

These methods are described in Part I

MEASUREMENT OF FIBRE SUPERCONTRACTION

A fibre was attached to two glass hooks by means of sealing wax, wet out in distilled water for at least 12 hr. and the length measured by holding the fibre under water against a steel rule. Excess water was removed from fibre and hooks by pressing against filter paper, and the two hooks were placed over a third hook formed at the end of a thin glass rod fixed in a cork. The assembly was placed in a test tube containing 10 ml. of reagent, this being a sufficient quantity to submerge the fibre and hooks. After the appropriate time the fibre was removed, rinsed, and remeasured under water.

Good reproducibility was obtained and normally four fibres were examined and a mean value of the supercontraction calculated.

Measurement under water was necessary because on drying, the treated fibres often became very brittle and a high proportion of breakages occurred during handling. Separate studies were made to establish the relation between wet and dry dimensions.

When the length of the nickel-containing fibres had been measured the nickel was removed by immersing for 10 min. in dilute (1%) sulphuric acid and then overnight in distilled water. Most of the recovery in length took place during the acid treatment and a subsequent brief rinse, but it was shown that in many instances a further small increase in length took place over several hours.

Results and Discussion

SERIES I

The first series of experiments was designed to assess the influences of time, concentration of reagent, and temperature on the supercontraction of wool fibres in nickelammonium hydroxide, and the results and other relevant data are given in Tables I–IV.

CONCLUSIONS

(i) The results in Table I show that the fibre contracts rapidly to a value of 30%, after which further contraction is slower. Fibres which have contracted by less than about 15% return to their original length after immersion in dilute sulphuric acid, but if the initial supercontraction is greater than this the reversion is incomplete.

(ii) The concentration of the reacting solution clearly has a very great effect on the rate of supercontraction, but the important fact emerges that the limiting contraction is in all cases the high figure of 40%. Reversion is no longer complete when the initial supercontraction exceeds about 15%, a value reduced by long immersions. For example, fibres treated for 12 hours in a solution containing 3 g. of nickel per litre supercontract by 7.5%; if further contraction is induced by prolonging the treatment the fibres will not regain their original length when the nickel is removed. Fibres treated for only 2 hours, however, in a solution containing 10 g. of nickel per litre supercontract by 15% and regain their original length after removal of nickel.

(iii) Although the rate of contraction is greatly reduced in solutions containing comparatively small concentrations of ammonia, the maximum supercontraction attained remains the same as that previously recorded.

TABLE I
The Supercontraction of Wool Fibres after
Immersion for Different Times in
Nickelammonium Hydroxide

(10 g. Ni + 240 g. NH₃ per litre; 0°C.)

Time of Treatment (hr.)	Initial Super- contraction*	Residual Super- contraction†
1	2.5	0.0
2	10.6	0.0
4	22.1	4.8
8	30.5	9.8
16	35.5	15.5
24	37.7	20.8
48	39.5	22.5

* Initial supercontraction refers to the contraction, as measured in water, of the nickel-containing fibres.

† Residual supercontraction refers to the contraction still remaining after the nickel has been removed.

TABLE II
The Supercontraction of Wool Fibres in Nickelammonium Hydroxide of Different Concentrations

Time of Treatment (hr.)	(240 g. NH ₃ per litre, 0°C.) Supercontraction (%) in solutions of nickel content (g./litre) —							
	3.0		5.0		10.0		17.5	
	Initial	Residual	Initial	Residual	Initial	Residual	Initial	Residual
1	0.0	—	1.2	—	2.5	—	8.5	0.0
2	1.1	—	2.7	—	10.6	—	29.6	2.7
4	2.0	—	8.0	—	22.1	4.8	30.7	10.3
8	3.8	—	15.5	1.1	30.5	9.8	33.8	14.0
12	7.5	0.6	22.0	5.8	—	—	—	—
16	11.0	2.3	29.0	10.1	35.5	15.5	35.0	17.5
20	17.2	4.5	32.6	14.1	—	—	—	—
24	22.0	6.8	36.2	16.3	37.7	20.8	39.5	20.2
32	33.2	15.1	38.4	21.0	—	—	—	—
48	37.5	25.7	—	—	39.5	22.5	38.8	23.5

TABLE III
The Supercontraction of Wool Fibres in
Nickelammonium Hydroxide Solutions
containing Different Amounts of Ammonia

(5 g. Ni + 65 g. NH₃ per litre; 0°C.)

Time of Reaction (hr.)	Initial Super- contraction (%)	Residual Super- contraction (%)
8	2.5	0.0
12	4.1	0.0
16	10.5	0.0
24	18.4	1.3
32	21.6	2.8
48	30.5	10.0
72	34.4	15.8
96	37.1	23.0
120	38.6	26.0

(iv) It is evident that, although the reaction possesses a considerable temperature coefficient, the maximum supercontraction is around 40% in all cases. Moreover, in general the relation between initial and residual contractions is about the same for all concentrations and temperatures, unless immersion is prolonged in which instance the reversibility is smaller. Lower reversibility is probably due to excessive degradation but it is also possible that side reactions produce cross links which hinder reversion.

From the number of graphs available an attempt was made to express in numerical form what may be termed "the temperature coefficient of supercontraction". Consistent results were not obtained, nor was any simple expression found to fit the

supercontraction curves. An interesting feature, however, is the very much greater effect that temperature has on the rate of supercontraction than on the rate of absorption of nickel (see Part I¹). For example, when working with a solution containing 5 g. of nickel and 240 g. of ammonia per litre, the times required to produce half the maximum supercontraction, i.e. $t_{20\%}$, are 24 hr., 30 min., and 15 min. at 0°, 20°, and 30°C. respectively. The times to half adsorption (11% of nickel) are roughly 4 hr., 30 min., and 10 min. respectively. Thus the increased rate of supercontraction cannot be ascribed solely to the increased rate of nickel adsorption, but must also be affected by thermal agitation.

TABLE IV
The Supercontraction of Wool Fibres in Solution of Nickelammonium Hydroxide at
Different Temperatures

(5 g. Ni + 240 g. NH₃ per litre)

Time (hr.)	0°C. Contraction %		Time (Min.)	20°C. Contraction %		Time (Min.)	30°C. Contraction %	
	Initial	Residual		Initial	Residual		Initial	Residual
1	1.1	0.0	15	3.5	0.0	15	10.7	0.0
2	2.7	0.0	30	20.1	2.4	30	32.5	11.1
4	8.0	0.0	45	30.5	9.5	45	36.0	20.3
8	15.5	1.1	60	35.0	17.1	60	37.8	24.2
12	22.0	5.8	120	38.8	25.4	90	40.1	27.7
16	29.0	10.1	180	38.6	29.2	120	40.4	29.5
20	32.6	14.1				180	40.3	33.5
24	36.2	16.3				240	40.0	35.1
32	38.4	21.0						

THE RELATION BETWEEN SUPERCONTRACTION AND THE AMOUNT OF NICKEL ADSORBED

Supercontraction experiments hitherto described were carried out in what is virtually an infinitely great liquor: wool ratio, in consequence of which the concentration of reagent changes only slightly during the experiment. It is therefore not possible to correlate the results with adsorption data from earlier experiments in which the liquor: wool ratio was 100:1 and in which the nickel concentration in solution falls appreciably during uptake of nickel by the wool. Experiments were accordingly carried out in which contraction took place in presence of sufficient loose wool to adjust the ratio to approximately 100:1. Four fibres were measured for each value and Table V was compiled from these data and those previously obtained from adsorption experiments.

TABLE V
The Relation between Supercontraction and Adsorption of Nickel
(10 g. Ni + 240 g. NH_3 per litre and 100:1 liquor ratio)

Reaction at 0°C.			Reaction at 20°C.		
Time (hr.)	Adsorption (%)	Contraction (%)	Time (min.)	Adsorption (%)	Contraction (%)
1	9.7	0.0	7.5	9.7	10.0
2	14.4	9.5	16	17.2	18.0
2.5	16.0	15.0	22	19.5	22.8
3	17.1	18.5	30	20.4	37.5
4	18.6	25.5	45	21.2	31.6
5	19.6	29.5	60	21.4	34.0
6	20.2	32.0	80	21.6	37.4
8	20.8	35.0	100	21.6	39.0
16	21.6	38.5	120	21.6	39.6

A graph of the 20°C. values can be extrapolated to pass approximately through the origin, thus showing that supercontraction takes place very shortly after nickel is taken up. At 0°C. there is, however, a considerable lag between the adsorption of nickel and the onset of supercontraction. For example, the fibre does not start to supercontract until 12% of nickel has been adsorbed, whereas at 20°C. the fibre has supercontracted by 12% by the time a 12% adsorption of nickel is attained. Likewise, supercontraction is not complete when the maximum adsorption is reached. At 0°C. wool adsorbs 18.6% of nickel after 4 hr. and the fibre contracts by 25%. After 16 hr. the adsorption increases only slightly, to 21.6%, but the supercontraction increases to 38%.

By using equilibrium values of supercontraction and adsorption it is, however, possible to obtain an entirely different relationship. To obtain such data the wool and single fibres for measurement were treated together for a prolonged period in dilute solutions of nickel ammonium hydroxide. In this way equilibrium adsorption values below the maximum of 22% were obtained together with the corresponding equilibrium supercontractions. Preliminary trials indicated that at 20°C. the equilibrium nickel adsorption was reached in about 8 hr., beyond which time degradation became serious and hindered subsequent analysis. Supercontraction, however, was not generally complete after 8 hr. at 20°C., but increased by a small

though measurable amount up to a total reaction time of 24 hr. The following procedure was finally adopted—A single fibre mounted on hooks was immersed along with 0.106 g. (dry weight) of wool in 10 ml. of reagent contained in a test tube. Three more samples were similarly treated so that the mean of four values could be calculated. After 8 hr. immersion one of the wool samples was removed and the nickel estimated in the usual manner. The length of the mounted fibre was measured, along with the three others, after 24 hr. Results are recorded in Table VI.

Clearly, no supercontraction takes place at 20°C. until approx. 7% of nickel has been adsorbed, and contractions of over 30% are obtained when the nickel content is only 12%. Maximum adsorption of nickel (22%) is not necessary in order to attain 40% contraction. Extrapolation indicates

that the maximum attainable contraction may be over 45% rather than the 40% hitherto suggested, though this high value is accompanied by severe degradation and low reversibility, which the earlier experiments were arranged to avoid.

TABLE VI
Equilibrium Values of Supercontraction and Adsorption

(240 g. NH_3 per litre at 20°C.)			
Concentration of nickel in solution (g./litre)		Adsorption at Equilibrium	
Initial	Final	Equilibrium %	Equilibrium %
1.56	0.75	7.55	1.00
1.78	0.86	8.65	9.20
2.04	0.91	10.66	23.80
2.28	1.01	11.99	32.30
2.54	1.15	13.10	37.40
2.84	1.34	14.20	39.50
3.02	1.43	15.00	40.60
3.54	1.83	16.20	42.90
4.85	2.87	18.70	44.80

DIMENSIONAL CHANGES OF NICKEL-CONTAINING FIBRES ON RINSING AND DRYING

A single wool fibre was clamped in a setting frame, wetted out in distilled water overnight, and the length measured by means of a travelling microscope. The fibre was slackened and the frame immersed in a wide glass tube containing sufficient nickelammonium hydroxide to cover the fibre completely. At intervals of time the fibre was

pulled taut, measured, slackened, and the frame removed and placed in a tall beaker of distilled water for 15 min. The fibre was again pulled taut and measured, the frame and fibre were roughly dried with filter paper, and the fibre was slackened and returned to the nickelammonium hydroxide solution. Owing to the brittle nature of the fibre when dry, a separate series of experiments was carried out to determine the change in length when the fibre is dried in a current of warm air. Results are shown in Table VII.

TABLE VII

Dimensional Changes on Rinsing and Drying Nickel-containing Wool

Time of Treatment (min.)	(4.8 g. Ni + 240 g. NH_3 per litre)		
	In Reagent	Contraction (%) In water	Dry
30	9.0	12.5	15.4
60	29.5	33.5	39.0
105	23.0	36.2	42.2
150	23.5	37.5	45.0
225	23.7	40.0	48.6
485	23.5	41.0	50.2

It was established that the changes in length from reagent to water to dry air were fully reversible. They are strikingly high and the most probable explanation is that the fibres have become more isotropic; if this is so then it might be expected that the fibre would show a change in

TABLE VIII

Contraction of a Nickel-containing Wool Fibre in Different Media

(Initial treatment: 1 hr. at 20°C. in 10 g. Ni + 240 g. NH_3 per litre)

Subsequent Immersions	Contraction %
At the end of the 1 hour treatment...	18.7
Absolute alcohol for 5 min. ...	33.3
Nickelammonium hydroxide for 10 min. more	20.0
Distilled water for 10 min. ...	27.1
Dry air for 5 min. ...	35.9
Nickelammonium hydroxide for 5 min. more	20.9
Distilled water for 10 min. ...	28.6
0.2 N-NaOH for 5 min. ...	16.9
Distilled water for 10 min. ...	28.6
Dil. H_2SO_4 for 10 min. and soaked overnight in distilled water ...	18.5

length when transferred from water to dilute sodium hydroxide solution. This does, in fact, take place, and data illustrating the change, and the generally reversible nature of the contractions, are given in Table VIII.

These results clearly illustrate the reversible nature of the changes under consideration, and support the suggestion that the contraction is greatly influenced by the swelling action of the medium in which the fibre is immersed.

REVERSION OF NICKEL-CONTAINING FIBRES IN SOLUTIONS OF DIFFERENT pH VALUES

In the experiments hitherto described nickel was removed from the wool by immersing in dilute (approx. 1%) sulphuric acid. Complete or almost complete removal of nickel is also effected by buffer solutions having pH values between 2 and 6, and also by ammoniacal ammonium salts; and if reversal is dependent solely on removing nickel then these solutions should be equally efficient.

Single wool fibres were treated for 30 min. at 20°C. in a solution containing 10 g. of nickel and 240 g. of ammonia per litre, after which they were removed, rinsed rapidly in concentrated ammonia solution, and for 10 min. in distilled water, measured, immersed overnight in 5 ml. of buffer solution at 20°C., measured, soaked for 24 hr. in 5 ml. of 1% sulphuric acid to remove residual nickel, measured, and finally measured again after soaking for 24 hr. in distilled water. Four fibres were so treated in each buffer solution, and the mean contraction values are tabulated in Table IX.

It is clear that reversal of contraction depends not only on the removal of nickel from the fibre, but also on the conditions under which it is removed. Moreover, under certain conditions it appears that the nature of the fibre is so altered that subsequent immersion in 1% sulphuric acid fails to produce further increase in length. This may perhaps be due to new stable bonds being formed inside the wool when the nickel is removed.

THE SUPERCONTRACTION OF WOOL FIBRES IN DILUTE SOLUTIONS OF NICKELAMMONIUM HYDROXIDE CONTAINING SODIUM HYDROXIDE

Wool swells when immersed in solutions of nickelammonium hydroxide, and the suggestion

TABLE IX

Reversion of Supercontracted Fibres in Solutions of Different pH Values

Solution	Initial Contraction %	Residual Contraction (%) after Immersion in —		
		(1) Solution in first column	(2) followed by 1% H_2SO_4	(3) followed by 24 hr. in Water
Control ...	32.2	—	12.8	9.9
pH 2 ...	32.8	16.6	16.6	15.1
pH 4.7 ...	31.5	19.0	19.6	18.7
pH 6.1* ...	31.4	24.7	24.9	23.5
10% $(\text{NH}_4)_2\text{SO}_4$ at pH 5.2	34.1	23.7	24.6	23.3
10% $\text{CH}_3\text{-COONH}_4$ at pH 7.0...	31.0	21.0	22.0	20.5
Ammonical $(\text{NH}_4)_2\text{SO}_4$ at pH 12 ...	33.0	27.8	27.0	27.5

* Buffer solutions of pH values 2.0 and 4.7 were prepared from sodium acetate and hydrochloric acid, and the buffer solution of pH value 6.1 from sodium hydroxide and potassium dihydrogen phosphate.

was put forward (Part I¹) that this swelling is an essential preliminary to the adsorption of nickel. As very dilute solutions of reagent fail to induce contraction, experiments were carried out in which sodium hydroxide was added to dilute solutions of nickelammonium hydroxide. Results are shown in Table X.

These results show that the rate of contraction is greatly enhanced when sodium hydroxide is present in the reagent. However, estimation of the amount of nickel adsorbed shows that it is small enough to produce no contraction under normal conditions, which suggests that supercontraction is promoted by swelling agents.

REVERSIBILITY AND WET-DRY LENGTH CHANGES OF FIBRES TREATED IN NICKELAMMONIUM HYDROXIDE AND SODIUM HYDROXIDE

Single wool fibres were immersed in solutions of nickelammonium hydroxide containing sodium hydroxide, under the conditions described in Table X. At the end of the allotted time the fibres were transferred from the reagent to distilled water and

information is required on the effect of chemical modification on the supercontraction and reversibility of wool in nickelammonium hydroxide, in order to discover which groups in the fibre play an important part.

THE DIMENSIONAL CHANGES OF CHEMICALLY MODIFIED WOOL WHEN IMMERSSED IN NICKELAMMONIUM HYDROXIDE

Single wool fibres were chemically modified according to the methods outlined in Part I. Supercontraction in nickelammonium hydroxide and subsequent reversion in dilute sulphuric acid were measured and the results are shown in Tables XIIA and XIIb.

TABLE XII

Supercontraction (%) of Chemically Modified Fibres in Nickelammonium Hydroxide

(10 g. Ni + 240 g. NH₃ per litre at 20°C.)

Columns (i) refer to the initial contraction.

Columns (ii) refer to the residual contraction after acid washing.

TABLE X
Supercontraction of Wool Fibres in Dilute Solutions of Nickelammonium Hydroxide containing Sodium Hydroxide

(1.2 g. Ni + 120 g. NH₃ at 20°C.)

0.1 N-NaOH		0.2 N-NaOH		0.4 N-NaOH		0.6 N-NaOH		0.8 N-NaOH	
Time (min.)	Contraction (%)	Time (min.)	Contraction (%)	Time (min.)	Contraction (%)	Time (min.)	Contraction (%)	Time (min.)	Contraction (%)
35	0.5	8	0.0	6	0.0	8	13.7	4	22.3
76	7.0	27	0.9	20	7.0	14	25.9	9	31.0
		66	15.3	29	15.8	25	34.0	18	34.5
				70	31.4	52	38.5	42	39.5
				100	36.5				

NOTE.—Measurements were carried out at intervals until fibre degradation prevented further handling.

were measured after 15 min. They were then dried in a current of warm air, re-measured, immersed in 1% sulphuric acid for 10 min. followed by distilled water overnight, and re-measured. Values obtained are shown in Table XI.

TABLE XI
Contraction and Reversal of Fibres treated in Nickelammonium Hydroxide containing Sodium Hydroxide

Contraction in Water %	Contraction Dry %	Residual Contraction %
19.5	26.0	4.0
24.6	30.8	7.7
27.8	36.0	11.4
35.0	46.0	14.5
40.4	50.0	15.7

The wet-dry changes, which are fully reversible, are much greater than those found with fibres treated with nickelammonium hydroxide alone, and may be caused by the treatment leading to greater isotropy. The degree of reversion in sulphuric acid is very much greater than for fibres treated in the normal manner, and is not easy to explain. In previous experiments, long treatments which greatly degrade the fibre result in poor reversibility, and as the fibres in this experiment were obviously seriously damaged a similar poor reversibility would have been expected. Clearly,

The only treatment which has completely stopped supercontraction is that using a 4 hr. acetylation, which is exceptional firstly because it is a severely degrading treatment and secondly because the acetylation itself produces supercontractions of up to 10% in the fibres. Acetylating for 30 min. reduces the contraction by half, which suggests that interference with the side-chain amino groups may prevent supercontraction. This however, is not borne out by the treatment with D.N.F.B., which inhibits contraction (presumably because it also inhibits nickel adsorption), the fibre ultimately contracting as much as unmodified wool. D.N.F.B.-modified fibres also show a very high wet-dry reversible length-change.

Modifying the disulphide linkings with sodium hydroxide or potassium cyanide appears slightly to reduce the supercontraction, from 40 to 30%, which is probably caused by the introduction of a more stable cross-linking.

The most striking aspect of the results shown in Table XII is the behaviour of the fibres when immersed in dilute sulphuric acid. Fibres modified by acetylation, D.N.F.B., and mercuric acetate either do not revert at all to their original length, or actually contract further, which is difficult to understand. It would appear reasonable to suggest that the introduction of bulky groups, while not being able to stop the powerful contractile

TABLE XIIIa

Time of Treatment (min.)	Unmodified Wool		Acetylated 30 min.		4 hr.		NaOH-treated		KCN-treated		Methylated		Methylated & Acetylated	
	(i)	(ii)	(i)	(ii)	(i)	(ii)	(i)	(ii)	(i)	(ii)	(i)	(ii)	(i)	(ii)
5	—	—	11.0	12.0	—2.0	11.8	17.8	0.0	20.3	0.0	—	—	—	—
15	3.5	0.0	16.2	21.6	0.5	19.2	25.1	1.0	31.6	1.4	20.2	4.2	15.9	6.3
30	20.1	2.4	16.9	23.5	1.0	17.6	28.7	3.0	31.6	2.4	31.3	21.9	27.2	21.9
60	35.0	17.1	18.6	27.5	—	—	30.5	5.6	32.9	6.8	34.2	29.5	33.6	29.7
90	—	—	—	—	1.0	21.5	31.2	6.2	—	—	—	—	—	—
120	38.8	25.4	—	—	—	—	31.2	7.0	33.7	13.2	36.5	33.6	33.8	30.9
180	38.6	29.2	18.0	28.9	—	—	31.5	10.6	—	—	—	—	—	—

TABLE XIIIb*

Time (hr.)	Untreated Wool		Dinitrofluorobenzene-treated Wool		Dry		Wool treated with Mercuric Acetate	
	(i)	(ii)	(i)	(ii)	Dry	Time (min.)	(i)	(ii)
0.5	20.1	2.4	0.0	0.0	0.0	20	28.6	34.3
1.0	35.0	17.1	0.0	0.0	0.0	30	12.3	28.5
1.5	—	—	6.1	9.8	0.0	40	14.5	30.5
2.0	38.8	25.4	24.1	31.4	21.1	45	11.1	24.3
3.0	38.6	29.2	33.1	41.4	33.6	70	16.2	29.7
4.0	—	—	34.6	41.5	40.6	120	All fibres broke	
8.0	—	—	40.7	47.7	43.0			
16.0	—	—	44.2	56.2	48.2			

* Dinitrofluorobenzene-treated wool is listed in a separate table because of the different time-scale involved and also because the unusual wet dry treated, and acidified, dimensional changes are recorded. Mercuric-acetate-treated fibres give irregular results, which cannot be expressed in graphical form.

forces, which are set up during adsorption of nickel, can yet successfully oppose the much weaker forces of reversion; this, however, hardly explains why acid treatment contracts the fibre still more.

A further notable point in these results is the great improvement in reversibility of fibres modified by treatment with sodium hydroxide and potassium cyanide. It is reasonable to

suppose that a new stable bond, which slightly reduces the maximum supercontraction, will also improve the recovery properties.

DEPARTMENT OF TEXTILE INDUSTRIES
UNIVERSITY OF LEEDS

(Received 23rd June 1953)

Reference

¹ Bell, J. W., and Whewell, C. S., J.S.D.C., 68, 299 (1952)

CORRESPONDENCE

The Editor does not hold himself responsible for opinions expressed by correspondents

Terms and Definitions

27. PADDING

May I suggest that this definition is not complete? I suggest that not only fabrics but yarns in the form of hanks and warps are also padded—and sometimes dried—before being developed in dyeing by the azoic process.

I suggest that the Committee consider this point and that "fabric" is not sufficiently embracing.

C. M. WHITTAKER

1 WEAPONNESS PARK
SCARBOROUGH

30th July 1953

34. AZOIC COMPOSITION

I would suggest the omission of the word "stabilised", as it appears to restrict the definition¹ to those compositions containing ingredients in a state of suspended reactivity, e.g. the passively stabilised diazonium compounds. It is possible to use ingredients which are not normally considered to be "stabilised".

It seems to me that the essential feature of the term *azoic composition* is that it describes an

entity capable of being applied to the substrate, by the common process reagents of steam, acid, etc., in one operation. "Stability" of the ingredients is incidental, and not significant.

J. S. HEATON

TAME HOUSE
REDDISH VALE
STOCKPORT
CHESHIRE

29th July 1953

¹ J.S.D.C., 69, 257 (July 1953)

Letters to the Editor

You may recollect that last year you published a letter¹ from me on the above subject wherein I deplored the lack of a lively correspondence in the *Journal*. I remember that the Publications Committee were good enough to endorse the suggestion.

There has been no response to the appeal, which I regard as a pity.

It is not my intention "to start a ball rolling" with the following argument, though I do hope some useful suggestions may arise.

It seems to me that technical verbiage is running a long way ahead of knowledge and that also

words are being used where unfitted for the purpose.

We are told that if product A is mixed with product B, neither being cellulosic in character, the resultant thread arising from the mixture, be it a polyamide or a polyester, is "synthetic". And now scientists, technicians, research organisations, commerce, and even the man in the street refer to "synthetic fibres".

I object. It is a misuse of the meaning of the word "synthetic". There is no need here to quote the meaning of the word, which can be seen by the members in all the dictionaries at their command.

The issue is not difficult. The word *rayon* is now accepted internationally and should therefore remain. It is a good word for the regenerated cellulosic fibres.

My plea is that no one has, as yet, seen a synthetic fibre since no one has ever produced one. We have produced "man-made fibres" though I suggest the words sound pompous and philosophers

would or might argue that nothing ever was man-made anyhow. What about "chemical fibres"? The term is used. Or can someone think of better words? I see nothing wrong with the words "chemical fibres" as such, and, surely, the words have no derogatory sense and are less cocky than man-made.

If there is objection to my plea on the ground that the term "synthetic fibres" is now universal, it falls on all of us then to find an alternative word to "synthetic", and give it a revised meaning. I am bound to ask for the word to describe e.g. indigo. Surely it is agreed that "synthetic indigo" is a correct term and that being so it is absurd to talk or write about "synthetic fibres". There are no synthetic fibres.

H. A. BRASSARD

136 GROVE HALL COURT
HALL ROAD
LONDON N.W.8

26th October 1953

¹ J.S.D.C., 68, 176 (May 1952)

Notes

Meetings of Council and Committees November

Council—18th
Finance—5th
Publications—17th
Colour Index Editorial Panel—4th
Abstractors—6th

Leeds Junior Branch

At the Annual General Meeting of the Leeds Junior Branch, held on 8th October 1953, the following elections were made—

Chairman	...	Dr. C. B. Stevens
Vice-chairman	...	Mr. C. L. Bird
Honorary Secretary	...	Mr. J. V. Butcher
Committee	...	Mr. J. S. Bindra
		Mr. H. K. Partori
		Mr. P. J. Smith
		Miss J. M. Wilson

Bradford Junior Branch

Mr. G. F. C. Fathers has been elected Chairman, and Mr. N. G. Morton Honorary Secretary, of the Bradford Junior Branch.

Worshipful Company of Feltmakers

The following officers were elected on 2nd October 1953 for the ensuing year—

Master	...	Mr. Joseph Begley
Upper Warden	...	Sir Geoffrey Christie-Miller, K.C.B., D.S.O., M.C., D.L.
Renter Warden	...	Mr. E. B. Laycock, O.B.E.
Third Warden	...	Lt.-Col. John A. Christie-Miller, O.B.E.
Fourth Warden	...	Dr. T. Collyer Summers, M.B., B.S., F.R.C.S.
Clerk	...	Mr. S. A. Williamson
Deputy Clerk	...	Mr. Ian D. Wilson
Beadle	...	Mr. Kenneth Holmes

French Patents

The French Government has issued three decrees of interest to owners of French patents. Firstly the procedure for assigning French patents has been greatly simplified; moreover, it is no longer necessary to pay all renewal fees in advance on assignment. Secondly, French patents will no longer be automatically forfeited for non-working; compulsory licences may be granted. Thirdly, provision is made for compulsory licences to be granted under patents relating to pharmaceutical products and remedies which have been available in insufficient amount or at too high a price.

L E J

The Position of the Synthetic Fibres in the U.S.A.

According to the *Chemical Trade Journal* (133, 884 (9th October 1953)) recent reports from the U.S.A. suggest that some of the newer synthetic fibres have run into rather rough water, especially the acrylic fibres offered for blending with wool. Some weeks ago five-sixths of the Chemstrand Corporation's Acrilan plant at Decatur, Alabama, was shut down, and the remaining unit of 5,000,000 lb. annual capacity put to work on an experimental basis only. The main cause of the trouble is understood to be the tendency of the fibre to split or fibrillate, one result being to produce complete change in the appearance of the dyed material. Criticisms in other directions have been made by the textile trades. The makers of the fibre say that the causes of the trouble are known and the problem has been solved in theory but that it will be eight months before the improved fibre is produced in bulk. Commenting on the general position, a U.S.A. correspondent of the *Financial Times* wrote on 1st October 1953 that there is now evidence of a general swing of the

pendulum in the American market back to natural fibres, even nylon losing some of its textile-trade appeal except for women's hosiery. c o c

British Leather Manufacturers' Research Association to publish Album of Photomicrographs Showing the Effects of Tanning on the Fibrous Structure of Leather

The Association has been granted £16,500 under the Conditional Aid Scheme partly to pay for the production of an album of about 30,000 photomicrographs showing the effects of disease and methods of prevention and tanning on the fibres and the structure of skins and leather. The remainder of the money is to be used to enlarge the Association's liaison staff. c o c

The Request and Suite of a true harted Englysshe Man, wishing the Wealth of his Native Country

By William Cholmeley, Londyner, 1553

Mr. L. E. Morris, Editor of *The Dyer*, has presented to the Society a photographic copy of the above manuscript, now in the National Library of Scotland. It consists of 68 pp. bound in contemporary leather stamped with the letters ER having between them the arms of Edward VI to whom the manuscript is addressed. It was given to the Advocates' Library, Edinburgh (now the National Library of Scotland) in 1705 by an Edinburgh merchant, William Blackwood. Unfortunately, nothing is known either of Blackwood or of the previous history of the manuscript. It is possible that it was originally in the Royal Library and came into private hands during the Common-

wealth, when so much Crown property was dispersed.

The contents of the manuscript were printed in the *Camden Miscellany*, Volume 2 (1853), edited by W. J. Thomas. It is essentially a plea for the setting up of a dyeing industry in England so that cloth could be exported dyed and finished instead of being exported in the grey to Flanders and France to be dyed there. The author was a grocer who in partnership with a dyer engaged Continental workmen and established a dyehouse in Southwark, using water from the Thames. His venture was most successful both technically and commercially. He proved that contrary to what was settled opinion that Thames water was suitable for dyeing colours as fast as any that were produced on the Continent, in fact part of his plea is for the setting up of standards of dyeing. It is interesting to note that at this time dyers were still using wood as fuel though the smiths were using coal which Cholmeley claims he had proved by experience was better than wood for heating dye vats. He complains of the wasteful methods of English dyers saying that they got nothing like the same degree of exhaustion of the dye liquors as did the Continental dyers. Some of his arguments, especially those on economics, sound very modern, for instance, he is greatly concerned about the drain of currency from the country and bewails the fact that the value of money has diminished threefold and particularly that it has depreciated less internally than externally in as much as that while the same exports only bring twice their former value yet the same imports have gone up to three times their former value. Exactly 400 years later we find ourselves in the same plight and so perhaps better able to appreciate his arguments than his editor of 100 years ago. c o c

OBITUARY NOTICE

John James Victor Armstrong

J. J. V. Armstrong was born in 1890. In 1906 he became a pupil of the late Mr. Sefton-Jones, a Chartered Patent Agent in London. In 1908 he went to the Textile Institute in Chemnitz, where he studied for two years. He passed the Qualifying Examination of the Chartered Institute of Patent Agents in 1911, and after spending a short time in Bradford was invited to Liverpool by the late Mr. W. P. Thompson. In 1915 he became a

partner in the firm of W. P. Thompson & Co., of which he was the senior partner at the time of his death. In 1916 he joined the Royal Naval Air Service as a Lieutenant and was engaged on wireless research until he was demobilised from the Royal Air Force with the rank of Captain. In 1945, on the death of his partner, Mr. H. E. Potts, he was elected Honorary Patent Agent to the Society of Dyers and Colourists, but resigned this office, owing to ill-health, in 1950. L. E. JONES

New Books and Publications

Colour and Light at Work

By Robert F. Wilson. Pp. xi + 148. London: Sevenoaks Press Ltd., 1953. Price, 25s. 0d.

The aim of this book is to draw the attention of industrialists to the value of the intelligent use of colour and lighting schemes in enhancing the appearance of factories and machinery, and thereby improving working conditions and

raising productivity. Amongst the subjects discussed are—the general principles of illumination, the choice of colour schemes, the principles of the use of complementary colours, the psychological effect of colour in working surroundings, and the improvement in factory output effected by their study and application. There are a number of diagrams and colour plates. C. H. GILES

Lehrbuch der Textilchemie

By H. Rath. Pp. xi + 627. Berlin: Springer-Verlag, 1952. Price, DM. 78.00.

In the foreword to this book, Professor Rath discusses at some length his object in writing it. This, it appears, is to describe the whole field of textile chemistry in fundamental terms, so as to provide a sound basis for the understanding of textile technological processes. To this end the author describes in about 200 pages the basic chemistry of textile fibres, dyes, auxiliaries and finishing agents, using many commercial products as examples. The organic chemistry of these textile "raw materials" is comprehensively treated and well illustrated by equations and structural formulae in the classical style. Textile research work has shown, however, that the terms required for a fundamental description of many textile phenomena are physicochemical in nature, and in this respect the account is by no means complete.

The remaining two-thirds of the book is taken up with an account of the textile technology of fibre manufacture, bleaching, dyeing, printing and finishing, and discussion of this technology in terms of the foregoing fundamental concepts. Within the compass allowed, the account is essentially complete and up to date with regard to both materials and technique and is illustrated by many excellent diagrams and photographs particularly of machinery. The discussion is rather disappointing. Whilst the mechanism of many processes is adequately treated by reference to the results of textile chemical research during the past 20-30 years, the interpretation of others is restricted by the inadequate physicochemical background. This is particularly evident in the discussion of dyeing phenomena and the treatment provided can hardly be regarded as fundamental.

Whilst intended essentially as a textbook, this book is also put forward as a work of reference. No literature or patent references are given, however, although the names of certain authors and inventors are associated with particular topics. Whilst this may be of some benefit to the student, it is of little value as a guide to the literature, particularly since the list of authors and inventors mentioned is by no means internationally representative.

A point of particular interest to members of the Society is the complete lack of reference to any of the Society's work, e.g. the fastness testing of dyed materials, or the classification of dyes. In fact it is difficult to find any mention of work published in this Journal, which is particularly surprising in view of the fundamental considerations upon which much of this work was based.

J. S. WARD

Chemistry of the Metal Chelate Compounds

By A. E. Martell and M. Calvin. Pp. viii + 613. New York: Prentice-Hall Inc. 1952. Price, 97s. 6d.

During the course of reasearch on the chemistry of chelate compounds over a period of ten to fifteen years Professors Martell and Calvin have felt the need to arrange and classify the numerous data available in this branch of chemistry in order

to bring out the general principles governing structure and reaction more clearly. This has been done by an essentially experimental approach. The resulting book, with its systematic treatment of the data and its extensive bibliography should be of great value to other workers in this field and, because it is well conceived and written, an inspiration to chemists in general.

The subjects dealt with in the separate chapters include methods for establishing the presence of chelates, stability constants, the influence of the metal ion and the structure of the chelating agent, structure and catalytic effect of chelate compounds, bond types, separation of metal ions and some applications of chelate compounds. In each chapter, after an introductory discussion, appropriate experimental methods and data are reviewed, and illustrated with many specific examples. This arrangement is, of course, of great value to the research worker, but it is also a virtue of the book that the treatment can be understood by, and can interest, the general reader.

As an introduction for students the preliminary chapter is, perhaps, a little condensed, and would be of greater value if it were expanded.

It is unfortunate that there are a few errors in the numbering of equations. Where these occur they are too obvious to be misleading, but nevertheless they interrupt the smooth reading of the text.

Although water-softening and chemistry and application of the mordant and metal-containing dyes provide many examples of the formation of chelate compounds, the treatment here is not very extensive.

A. JOHNSON

Marking Containers

By the Association of British Chemical Manufacturers. First Edition, 1953. Pp. v + 90. London: The Association. Price 7s. 6d.

The Association of British Chemical Manufacturers has made a timely contribution to safety by publishing this booklet with the aim of safeguarding manufacturers, merchants, carriers, and users from possible hazards involved in handling chemical products.

Users are under a legal obligation to warn their own employees of any danger that may exist in processing or handling chemicals and manufacturers should, in their own interests, warn each person who is going to handle the chemical container of possible risks and tell him what to do in case of an emergency.

This is most easily accomplished by means of a distinctive label and it is obviously desirable that such labels should be standardised in form, colour and wording. This the A.B.C.M. has done in an admirable form with reproductions of typical labels and recommended wording for over 200 chemicals.

The wording indicates in a concise manner the danger from vapour, from skin absorption and when taken internally. The label states whether the chemical is inflammable, corrosive, miscible or immiscible with water, and what action should be taken for first-aid treatment and in case of spillage or fire.

This booklet should be in the hands of every manufacturer and user of chemicals and its recommendations should be accepted by all those who, in the course of their work are called on to prepare, use or transport chemical products.

A. THOMSON

Technique of Organic Chemistry

Vol. VIII. Investigation of Rates and Mechanisms of Reactions

Edited by S. L. Friess and A. Weissberger. Pp. xxii + 760. New York and London: Interscience Publishers, 1953. Price, \$12.50 or 100s. 0d.

There can be few chemists who have nothing to learn from this work of fifteen authorities, whose scope frequently exceeds the bounds of mere technique and those of organic chemistry. However, a composite work of this nature cannot serve to place the large subject of kinetics into philosophical or historical perspective, and those who seek to enter deeply into the true spirit of the subject should rather turn to one of the lofty monographs. Indeed, the work under review suffers more than necessary from the evils of multiple authorship, in particular as regards overlapping and gaps between chapters, and in the time lag between literature quoted and date of publication. For instance, stirred flow reactors are treated both by Livingston (p. 49) and by Grunwald (p. 131). There is no reference to transport control or diffusion in the index, but only a single mention of "diffusion layer". A chapter on transport would certainly not have been out of place, in a work which can allot one and a half pages to the kinetics of hydrolysis of mustard gases. Priest's admirable chapter on polymerisation and polymer reactions gives a fuller treatment than the corresponding chapter in Mark and Tobolski's text (same publishers, 1950), but it is notable that coverage of references extends to 1950 in these two chapters published at an interval of three years. Livingston's account of statistical methods, accuracy, and evaluation of kinetic data is a timely contribution. His warnings against the pitfalls of intuitive methods, in particular the "treacherous concept of rate determining reactions", are not addressed only to the novice who turns to this book for an introduction to kinetics. The treatment of acidbase catalysis by James is unduly historical for this type of book, since the majority of references are to papers earlier than 1930. Leffler and Grunwald's chapter on liquid phase reactions is disappointing. It gives too restricted a definition of ionic strength as " $\frac{1}{2}$ ional concentration". It is often cryptic in style, and surely does not help the organic chemist to appreciate the realities of kinetic experimentation by statements such as: "In order to obtain the correct rates of ion-pair formation, it will be necessary to increase the reactivity of the cage wall and extrapolate to infinite reactivity". Huennekens and Chance's fascinating chapter on biological reactions is useful in bringing biochemical apparatus to the notice of non-biological chemists. Burnett and Melville on short-lived intermediates, and Rough-ton and Chance on reactions in the milli-second

range, take the reader to the very boundaries of ingenious experimentation. This book is, of course, a *must* for those who have collected the earlier volumes in the series. Many others will acquire it, despite the shortcomings mentioned, because the need for such a book is undoubtedly pressing.

M. GORDON

The Application of Vat Dyes

A.A.T.C.C. Monograph No. 2

By the American Association of Textile Chemists and Colorists. Pp. x + 448. Lowell, Mass.: The Association. 1953. Price, \$6.00.

After a brief mention of the two naturally occurring vat dyes, Indigo and Tyrian Purple by way of introduction the monograph outlines the development of synthetic vat dyes as well as methods for their application.

Chapter II (50 pp.) deals with the principles of vat dye classification and application, including the effect on dyeing behaviour of caustic soda, hydrosulphite, temperature, electrolytes and retarding agents. Reference is made to possible damage by exposure to sunlight of unoxidised dyeings and to the determination of rates of dyeing, diffusion, degree of exhaustion, strike and levelling, though members of the Society of Dyers and Colourists will be disappointed to find no reference to the report published by this Society of the work carried out by its Committee on the Dyeing Properties of Vat Dyes, which appeared in the *Journal* in 1950. Methods are outlined in the A.A.T.C.C. monograph for carrying out a large variety of tests, including dry-cleaning, crocking, bleaching, mercerising, etc., etc., though no mention is made of methods of estimating the fastness to degumming of vat dyed silk.

Chapters III to VIII deal with the application of vat dyes to cotton raw stock, skeins, warps, packages, piece goods and hosiery by all the usual modern methods, useful illustrations and diagrammatic sketches appearing in each chapter.

Chapter IX deals with the dyeing of viscose, acetate, nylon and wool. The dyeing of natural silk is dealt with in one page and one hesitates to accept this as representing modern dyeing practice in America as, if so, American silk dyers would be at least 30 years behind their European competitors.

Chapters X and XI cover direct and discharge printing of vat dyes on cotton, viscose, acetate, wool, silk and nylon.

Chapter XII (30 pp.) is devoted especially to indigo while the uses of vat dyes as pigments or in non-textile applications are briefly outlined in Chapter XIII (6 pp.).

Chapter XIV (94 pp.) is reserved for the leuco esters of vat dyes and their application to cotton, viscose, wool, union material, silk and nylon as well as in printing.

The remainder of the book consists of data on 105 individual dyes in common use in America. Wherever possible this includes the graphical and empirical formula, mol. wt., number of chromophors, colour of alkaline and acid leuco compounds, temperature of reduction and dyeing, substantivity, stability, maximum concentration permissible in

vat-acid dyeing and references to the *Colour Index*, *JSDC* and *BIOS* and *FIAT* reports. Where leuco esters exist data on these are included also.

There is a tendency to break down the once clear-cut classification of vat dyes adopted by many dyemakers into a more detailed chart of the behaviour of individual dyes. This is inevitable as more and more information becomes available on the behaviour of each individual dye, and the classification of vat dyes into, firstly anthraquinonoid and indigoid and the sub-division of the former into the hot, warm and cold dyeing groups, had its uses for it enabled the dyer to group together easily those dyes which could be dyed in

admixture. The committee set up by the Society of Dyers and Colourists approached the task of classifying vat dyes with an open mind and found, after making wide-reaching experiments, that the classification adopted by most dye manufacturers was sound. It is a great pity that such vital information is not included in this A.A.T.C.C. Monograph and it is hoped that it will be included in future editions.

In spite of this omission this monograph should be in the hands of every user of vat dyestuffs, every student and every teacher. The book is well indexed and includes valuable lists of equivalent trade names. It will certainly take its place as a standard book of reference. A. THOMSON

Manufacturers' Publications and Pattern Cards

The Society does not accept any responsibility with regard to the statements in the following notes. Any publication abstracted may be referred to by members of the Society on application to Dr. C. B. Stevens, Dyeing Department, Leeds University

Farbenfabriken Bayer

PHTHALOTROP B—This is a resisting agent the use of which enables white and coloured resists to be obtained under Phthalogen Brilliant Blue IF3G. It is marketed as a clear yellow liquid miscible with water in all proportions. The active constituent reacts chemically with Phthalogen Brilliant Blue IF3G thus preventing development of the colour and the product is thus suitable for both first-printed and overprinted resists. For coloured resists the Rapidogen or Rapidogen N brands are particularly recommended.

ACRAMIN RESISTS—This circular describes various methods of producing resists under Aniline Black and Variamine Blue using the Acramin F process. Four prints are included illustrating some of results which may be obtained.

ACRAMIN F PROCESS: ACRAMIN ORANGE FRR; RED FB; RED VIOLET FR—This circular contains direct prints on cotton cambric, spun viscose rayon muslin and cuprammonium rayon of three new dyes in the Acramin range together with detailed instructions for the application of this type of dye to cotton, rayon, silk and the synthetic fibres. With the Acramin film forming agents and Acramin dyes now available, Arafix F paste is no longer required when printing on cotton, the Acramin film being formed by the use of Acramin FWR which takes place at 80°C. with the aid of Acramol W. Acramin prints on cotton can therefore be fixed by drying the printed material at 80°C. for a minimum of 4 min. With all other fibres Arafix F paste is required for the formation of the film.

ACRAMIN F PROCESS—This circular gives an account of further practical experience in the production of Acramin coloured resists under aniline black and Variamine Blue and also contains some comparative figures for consumption of dye when using Acramin F, Indanthren, Rapidogen, Anthrasol and direct dyes.

Imperial Chemical Industries Ltd.

Auxiliary Products Pamphlets

No. 53. **LUBROL JN: A LUBRICANT FOR JUTE.**
No. 70. **CALASEC MAH: A THICKENING AGENT FOR USE IN FINISHING.**

No. 81. **LISATAN F**—This is a 20% aqueous solution of dinaphthylmethane disulphonic acid. It possesses appreciable tanning properties and being strongly acid may be employed for controlling the pH value of vegetable tanning liquors.

No. 85. **CALAROC UFB**—This is a stable, water soluble urea-formaldehyde precondensate marketed as a clear, viscous liquid with a solids content of 90% equivalent to 70% of resin in the cured state. It is recommended for producing stiff finishes and for fixing starch and pigmented starch finishes.

Technical Circulars

BEDACRYL L IN LEATHER FINISHING—This describes the use of Bedacryl L, an aqueous dispersion of a higher alcohol methacrylate polymer, to give flexible, tough, clear films which are insoluble in water and have excellent adhesion. The product is thus suitable for producing sealing coats prior to applying nitrocellulose or water pigment finishes.

SOME VARIABLES IN PAPER DYEING—This circular describes the effect of the nature of the raw material, of sizing, of beating and of filling on the results obtained when dyeing paper in the beater. The effect of each variable is illustrated by dyed samples prepared using one typical member of each of the following classes of dye—basic, acid, direct and pigment.

FASTNESS PROPERTIES OF DYESTUFFS FOR LEATHER—Data are given for the fastness to light and washing, solubility and penetration of ranges of acid (including Naphthalene Leather), direct, Ultralan (premetallised) and chrome dyes. The methods of assessment employed are largely based on the "Report on the Fastness of Dyes on Leather", J.S.D.C., 65, 325 (1949).

THE PRINTING OF ARDIL PROTEIN FIBRE UNIONS—This circular describes the printing wool-Ardil and viscose rayon/Ardil mixture cloths, respectively. The classes of dyes recommended for the former include acid (together with Ultralans), the more soluble Solochrome dyes and selected Chromozols, direct and Brentogen dyes applied by the neutral development method with Brentogen Developer N. For viscose rayon-Ardil mixtures the following are recommended; vats, selected mordant dyes, Brentogen and Brentamine Rapid dyes, direct dyes by the urea process, acid dyes using either the urea process or the ammonium oxalate method, Soledons and Diphenyl Black. The fastness to light and repeated mild washing of the suggested dyes on each type of material is tabulated and detailed recipes for applying acid, Ultralan and mordant dyes to wool-Ardil unions are given in an appendix.

THE SUITABILITY OF DIRECT DYESTUFFS FOR THE DYEING OF VISCOSE RAYON Cakes—This circular contains the results obtained when the range of Chlorazol and Durazol dyes were applied to viscose rayon cakes (450 g. 150/27) under standardised conditions in a laboratory circulating liquor machine. According to the degree of levelness, each dye has been placed in one of the following four groups: Group I—perfect or nearly perfect levelness; Group II—a slight degree of unevenness; Group III—a marked degree of unevenness; Group IV—very poor penetration, the less accessible portions of the cake being undyed. In each case the corresponding S.D.C. classification is quoted and practical suggestions are included, among them the use when possible of the Chlorazol and

Durazol "P" brands, which contain the minimum quantity of electrolyte.

THE ABBOT COX PROCESS FOR VAT DYEING GOODS IN PACKAGE FORM—This circular is a revised and enlarged edition in which the process originally designed for applying Caledon dyes to continuous filament viscose rayon cakes is extended to cover other packs and packages of cellulosic fibres. Theoretical and practical considerations are dealt with, typical recipes provided and tabulated data provided concerning the behaviour of a complete range of vat dyes with reference to their application by this general technique.

THE PRINTING OF TERYLENE POLYESTER FIBRE—The possibility of printing Terylene with a wide variety of dyes of different classes has been examined and it has been found that the following are the most suitable. Duranol and Dispersol (disperse) dyes using *p*-hydroxydiphenyl and/or high pressure steaming; pigment printing compositions, e.g. selected Monolite dyes applied by the Bedafin 2001 process; Alcian Blue 8G; and selected vat dyes applied as acid leuco compounds and fixed by steaming under a minimum pressure of 20 lb. per sq. in. followed by oxidation with nitrous acid or boiling ammoniacal hydrogen peroxide. Very recent work has shown that a pad-steam technique is of possible interest in which a thickened paste of unreduced dye is printed onto the fibre followed by padding in a solution of zinc sulphoxylate formaldehyde followed by steaming under pressure. Printing recipes and tabulated fastness data are included.

TUMESCAL D: A DYEING ASSISTANT FOR TERYLENE POLYESTER FIBRE—Tumesal D is a cream coloured powder consisting, essentially, of a readily emulsifiable form of diphenyl recommended as a dyebath addition when dyeing Terylene with disperse and azoic dyes. The effect of adding this product on the uptake of dye, on temperature range and build-up properties and the effect of liquor:goods ratio on the efficacy of the product are illustrated graphically. Typical dyeing recipes using Tumesal D when dyeing disperse and diazotised and developed disperse dyes are included.

Sandoz Products Ltd.

ARTISIL DIRECT YELLOW RCFL—This disperse dye gives golden yellows of very good fastness on acetate rayon, nylon, and Terylene (Dacron) either as loose fibre, yarn or cloth. It is particularly recommended for use in combination with Artisil Direct Blue GFL on acetate

rayon for greens fast to light and gas fumes. When dyeing Dacron or Terylene it is suggested that 5 c.c./litre Dilatin be added to the dyebath. The dyeing temperature used for nylon (90–95°C.) is satisfactory but the dyeing time should be increased. Fastness figures on acetate rayon include—Light 6–7, washing 4, gas fumes 5.

LANASYN BROWN 3RL—This neutral dyeing acid dye gives dyeings considerably redder in hue than those obtained using the RL brand which it closely resembles in dyeing properties.

It is recommended for use alone and in combination with Lanasy Brown RL, Grey BL and Yellow 2RL for fast dyeings on wool and polyamide fibres alone and in mixture on loose material, yarn and cloth. It is unaffected by chrome in the dyebath and is also of interest for direct printing on wool, silk and nylon and for Vigoureux printing. Fastness figures on wool include—Light 7, washing (60°C.) 4–5, severe alkaline milling 4.

LANASYN ORANGE RLN—Similar in dyeing and fastness characteristics to the Orange RL brand which it replaces, this addition to the Lanasy range gives dyeings somewhat yellower in hue. It is recommended for dyeing wool, nylon and wool-nylon mixtures and silk and for direct and Vigoureux printing. It is readily dischargeable.

Fastness figures on wool include—Light 7, washing (60°C.) 4–5, severe alkaline milling 4–5.

OMEGA CHROME BROWN PGL: METOMEGA CHROME BROWN PGL—This chrome dye gives dark browns of good fastness to light, potting, acid and alkaline milling and carbonising. It may be applied by all three methods and is particularly recommended for use on loose wool and slubbing. It is difficult to chrome on polyamide fibres and is not suitable for Vigoureux printing. Fastness figures on wool dyed by the Metomega Chrome (single bath) method include—Light 6–7, carbonising 4–5, acid milling 4–5.

OMEGA CHROME BROWN PRLL: METOMEGA CHROME BROWN PRLL—This chrome dye gives deep reddish browns of extremely good fastness to light. It is recommended for application by all three methods on loose wool, slubbing, yarn and cloth. It is suitable for machine dyeing and Vigoureux printing. It is difficult to chrome on nylon and on this account is less suitable than the Brown RLL brand for dyeing polyamide fibres. Fastness figures on wool dyed afterchrome include—Light 7–8, severe alkaline milling 5, potting 4–5.

Abstracts from British and Foreign Journals and Patents

The titles of abstracts may be modified. Abbreviations of names of firms are listed in J.S.D.C., 68, 23 (Jan. 1952), and also, together with symbols and the periodicals abstracted, in the annual index

I—PLANT; MACHINERY; BUILDINGS

PATENTS

Drying Sludgy and Pasty Products in a Stage Drier.

Buttner-Werke. BP 698,838
The material is split into small portions as it is being fed into the drying chamber. C. O. C.

Thread Advancing Reel. H. A. Kuljian. BP 698,132

A thread advancing and storing reel comprises elongated rolls arranged about a central post, the whole being supported by end plates. The rollers are individually rotatable to advance the thread, in helical windings circumscribing the rolls, through a liquid treating section and then through a drying zone. Drying is effected by a blast of hot air which passes through perforations in the central post and thus outwards against the surrounding rollers which carry the thread. Hot air is provided by a built-in heat exchanger. J. W. B.

Thread Storage, Thread Advancing Reel. American Enka Corpn. USP 2,627,102

A cantilever supported thread storage, thread advancing reel of simple design which enables ready adjustment of the time taken by the yarn to traverse the reel. C. O. C.

Increasing the Tensile Strength of Yarn. Specialities Development Corpn. USP 2,627,480

The yarn is impregnated with a liquid preferably containing a bonding agent and then through a series of

squeeze rollers. While passing through these rollers the yarn is untwisted and retwisted to assist in thorough impregnation. C. O. C.

Treating Yarn under Tension. Dan River Mills. USP 2,627,103

Variations in residual stretch of the untreated thread are compensated for before the yarn is brought under tension for treatment, thus enabling the maximum amount of tension possible to be safely applied. C. O. C.

Printing Roll. Joseph Bancroft & Sons Co. USP 2,627,228

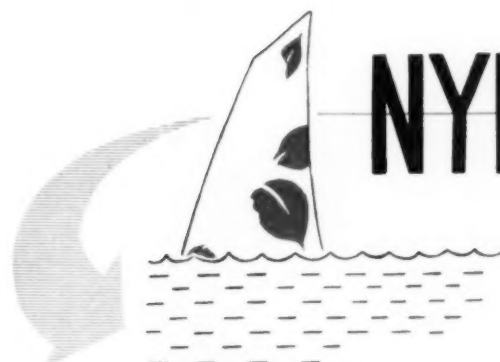
A simple roll of light construction which wears well and contains much less copper than the rolls hitherto used. C. O. C.

Calender for Rubberising Tyre Cords and Fabrics. Firestone Tire & Rubber Co. USP 2,627,296

A calender in which the individual ends of a webless cord fabric are placed under equal tensions just before and after their passage through the nip. C. O. C.

Treating a Tow of Filaments or Threads in a Limited Space. ICI. BP 697,957

A continuous tow of filamentary material is introduced, along with treating liquid of a lower specific gravity, into the end of a tube which has an internal surface sloping downward at such an angle that a sufficient length of tow collects along the bottom to permit adequate treatment; finally the material is withdrawn along an upturned



NYLOTAN M & R

Reserving agents for Nylon and other
polyamide fibres

To produce white or coloured
effects in mixture fabrics

Nylotan M for permanent reserving
and fixing of direct and acid colours
in such mixtures

Nylotan R for use when wool or
silk are present in mixtures
with polyamide fibres



Sandoz
PRODUCTS LTD.
BRADFORD

Drayton

AUTOMATIC DYE VAT CONTROL

FOR ALL TYPES OF MACHINES

Drayton dye vat regulators are completely automatic, absolutely dependable and do not call for skilled operators.

These dye vat controls maintain a continuous degree of accuracy in dyeing processes unobtainable by manual control. They reduce working costs and ensure improved and uniform production.

Drayton automatic control systems have the highest reputation for reliability in every branch of industry.

TYPE DVI REGULATOR

The simplest regulator available. For control of top temperature only.

TYPE DVIT REGULATOR

This regulator is for top temperature only but includes a timing feature and signalling switches.

TYPE DV3 REGULATOR

(illustrated)

This regulator is unique in conception. It will maintain a continuous variable rate of temperature rise in terms of degrees per minute; the bottom temperature, the top temperature, the rate of rise and the length of cycle being conveniently adjustable. Signalling feature is incorporated.



"The application of Automatic Control to the Dyeing Process"

This new publication contains valuable information gained in field experience in collaboration with leading dyers, machine manufacturers, etc. It demonstrates the advantages and the limitations of automatic control, its application, the selection of equipment. The book explains which machines can and which cannot be controlled - and why.

Send for this booklet

DRAYTON REGULATOR & INSTRUMENT CO. LTD., WEST DRAYTON, MIDDX (West Drayton 2611)

DV2a

75 minutes from start to finish

including shading

Legalans

for fine worsted pieces

in normal equipment

REVOLUTIONISE WOOL DYEING

Geigy

A18

The Geigy Company Ltd - Rhodes - Middleton - Manchester



Reducing Agents . . .

Since Rowlandson drew his fearsome boudoir scene, reducing agents, both fashion and textile, have made enormous progress. In place of unpredictable chemicals of limited scope Brotherton's

have put at the disposal of the modern textile manufacturer a complete range of reliable reducing agents. These allow him a more economical yield from vat colour dyes, finer print control and finish, and a greater consistency of work generally.

Brotherton

HYDROSULPHITES

Hydros, Formosul, Redusol Z, Zinc Formosul, Leucotropes for



Discharge printing, Vat colour dyeing, Vat colour printing and Stripping

BROTHERTON & CO. LIMITED, LEEDS, ENGLAND

Papilio columbus flies in the eastern mountains of Cuba. It is the most brightly coloured of the American "Swallowtails"



Sulphol Colours

For all types of Machine, Piece, Hank and Loose Stock Dyeing. Also for the Rubber Proofing Trade, for which a wider range is now available

•
SULPHOL Colours are Non-Migratory, thus ensuring their use in fabrics for plasticising

•
SULPHOL Colours may be applied from a Caustic Soda and Sodium Hydrosulphite bath. Details of application on request

JAMES ROBINSON & CO LTD

HILLHOUSE LANE HUDDERSFIELD ENGLAND

Telephone 334-335

Telegrams ROBINSON HUDDERSFIELD

Brenthol BC



new I.C.I speciality

for scarlet, red and garnet shades on all types of cotton and viscose rayon

Fast to light, washing and bleaching

High solubility and ease of solution

Stability of solution and prepared goods · High substantivity

For further information please apply to

IMPERIAL CHEMICAL INDUSTRIES LIMITED, LONDON, S.W.1



D.322

A SERIES OF BRITISH WILD FOWL



TUFTED DUCK

Frequents lakes and other fresh waters of medium to large size, but is rarely seen near the sea. Easily becomes tame when protected. Dives for food.

CHLORANTINE FAST BLUE 76L
CHLORANTINE FAST BLUE 28LL
CHLORANTINE FAST BLUE 2RL

Three Bright Blues suitable for anti-crease work with spun viscose rayons



THE CLAYTON ANILINE CO LTD

CLAYTON • MANCHESTER 11

Telephone East 1341 (10 lines)

Telegrams CIBA MANCHESTER

and at BRADFORD • LONDON • LEICESTER • GLASGOW • BELFAST • BRISTOL
Sole concessionnaires in the United Kingdom for CIBA LTD Basle Switzerland

For over 20 years supreme

"Staybrite"
Steel

the ideal metal in the

TEXTILE INDUSTRY

Remarkable though its resistance is to the whole range of Textile dyestuffs and liquors, "Staybrite" steel has qualities of superb finish and mechanical strength which recommend it to the textile plant builder. The rapidity with which a dye vat can be washed out for another colour with no soakage or "carry over" is of importance, too.

FIRTH-VICKERS STAINLESS STEELS LTD., SHEFFIELD

The background of the entire advertisement is a high-contrast, black and white photograph of numerous skeins of wool yarn. The skeins are arranged in a dense, overlapping pattern, creating a textured, three-dimensional effect. The lighting highlights the individual fibers and the twisted structure of the yarn.

CIBALANS

Fast Shades Faster

Behind the Cibalans lie forty years' experience in the manufacture of metal-complex dyes. The Chlorantine Fast and Neolan series are examples of pioneer achievements in this field. The latest discovery of Ciba Limited has opened up new prospects for the dyer. The Cibalans offer as simple and reliable a method of working as the weakly acid dyeing wool colours, plus fastness properties which hitherto have only been obtainable by the much longer chroming process. These new products are further proof of Ciba's leading position in the development of pre-metallized dyestuffs.

Cibalan registered trade-mark

CIBA

for fast dyed shades on wool,
silk, and synthetic fibres -
and for Vigoureux printing.

CIBALANS

CIBA Limited, Basle, Switzerland

The Clayton Aniline Co. Ltd., Manchester 11

Sole Concessionnaires in the United Kingdom



Indanthren Brilliant Blue 4G

Particularly clear shade of excellent fastness
to light. Suitable for curtain
and furniture material.

Can be used for pigment padding, pigment
dyeing, and in the vat acid padding process.

Supplied for printing purposes as
Indanthren Brilliant Blue 4G Paste for printing.



Indanthren



FARBENFABRIKEN BAYER
AKTIENGESELLSCHAFT
LEVERKUSEN



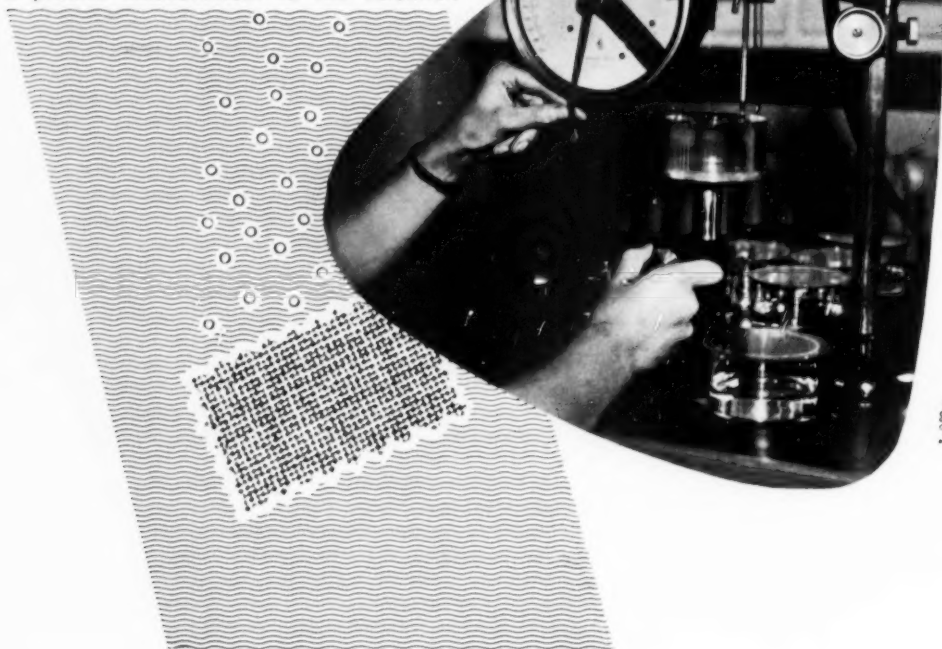


SERISOL
Dyestuffs
for
synthetic fibres

THE YORKSHIRE DYEWARE & CHEMICAL CO LTD LEEDS

SURFACE TENSION

very often an unknown quantity to the practical man —
a precise measurement to the scientist.



To-day, specially developed methods are used for measuring the surface tension of water, or solutions of surface active compounds, under widely varying conditions. Data so provided are invaluable in the synthesis of new wetting agents of ever increasing efficiency. In this field, BASF maintain their tradition of applying scientific knowledge to the benefit of industry. Results of BASF research have led to the latest speedy wetting-out and alkali stable product

RAPID WETTING AGENT RBD

For detailed information
apply to
ALLIED COLLOIDS
(Bradford) LTD.
Bradford
Manchester
London



Badische Anilin- & Soda-Fabrik A.G.
LUDWIGSHAFEN A. RHEIN / GERMANY

portion through which the liquid also flows away. The example quoted concerns the coagulation of a groundnut-protein-NaOH solution.

J. W. B.

Resilient Squeeze Rollers. Andre Rubber Co.
BP 697,814

A resilient roller for use in wool-washing machines comprises a number of interengaging annular rubber covers round a metal cone, which are held under pressure by end cheek plates; each cover has one or more annular ribs on one side-face and corresponding grooves on the other, thus ensuring a compact surface.

J. W. B.

Thread Processing Reel. Kuljian Corp.
USP 2,625,811

A thread holding and advancing reel on which the yarn is treated with several liquids which are prevented from intermingling.

C. O. C.

Holders for Yarn Packages during Dyeing. M. W. Reno and J. E. Dougherty.
USP 2,625,810

A holder for annular packages, cakes etc. of yarn which is easily and quickly loaded and unloaded.

C. O. C.

Registration of Fabric, Paper, etc. English Electric Co.
BP 697,974

Several marks or apertures in the fabric or the like co-operate with similar marks or apertures forming part of, or driven in correspondence with, a first element of the machine. This element operates on the fabric to form a series of apertures or reflective surfaces of areas varying according to the relative disposition of the web and the element. Light passing through the apertures or reflected from the surfaces operates a device which keeps the fabric and the element in predetermined registration.

C. O. C.

Hosiery Finishing. E. B. Bates.
BP 697,179

Hose are placed on thin flexible forms as they emerge from a curved nip between two rollers by means of which the forms temporarily assume a longitudinal trough shape. On leaving the rollers the forms regain their original flat shape. Forms are continuously fed to the rollers from a magazine.

G. E. K.

Pressing or Ironing Textiles. A. Freeman (Engineers).
BP 698,048

Steam is produced immediately below the buck, e.g. by water being sprayed on to the surfaces of a heated chamber, and fed to the buck in the exact amount required for the article being pressed.

C. O. C.

Beating Machine for Furs. S. W. Howarth.
BP 698,556

Earth and similar foreign material is removed from fur skins in apparatus having two beaters which alternately strike the skin in opposite directions. Each beater has diametrically opposed projections and their peripheries including the projections are unbroken by edges or sharp corners.

C. O. C.

Removing Down and Ground Hairs from Rabbit, Hare and other Fur Skins. S. W. Howarth.
BP 698,273

A perforated conveyor band co-operates with a vacuum to feed and hold the skin before a reciprocating mechanism which grips the down and ground hairs so as to break the down off the fur and either pull the ground hairs out of the skin or else break them.

C. O. C.

Removing Fur from Skins and Subsequent Cleaning It. S. W. Howarth.
BP 698,350

The fur is cut from the skin and carried by a current of air along a conduit to a fur settling and dust extracting chamber which may be of the type described in BP 267,292.

C. O. C.

II—WATER AND EFFLUENTS

PATENTS

Conditioning Water. Corn Products Refining Co.
USP 2,626,238

Addition of 10–4000 p.p.m. of sodium phytate effectually prevents formation of boiler scale, corrosion of iron in contact with the water and coagulation of insoluble soaps.

C. O. C.

III—CHEMICALS; AUXILIARY PRODUCTS; FINISHING MATERIALS

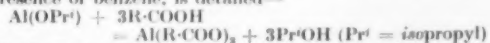
Textile Detergents and their Properties—I. M. Rosch.
Melliand Textilber., 34, 226–227 (March); 351–352 (April); 453–455 (May); 567–569 (June 1953).

A review of the different types of detergent, followed by a full discussion of their relative properties under the headings—foaming, wetting, resistance to hardness, protection against calcium soaps, resistance to acid and alkali, emulsifying power, effect on handle, and washing power. The advantages of mixing detergents of different classes are indicated. It is shown that mixtures of alkyl-benzenesulphonate and alkylphenol-ethylene-oxide condensate have less detergency than either component alone. An explanation of this phenomenon is given.

H. E. N.

Preparation of Aluminium Trisoaps. R. C. Mehrota.
Nature, 172, 74 (11 July 1953).

The preparation of aluminium tri-palmitate and tri-stearate by the following reaction, carried out in the presence of benzene, is detailed—



The isopropanol produced is removed azeotropically with the solvent. The method appears to be of general application, and has been extended to the soaps of Ti and Zr.

J. W. D.

Temperature Effects in Thixotropic Systems. G. B. Moses, A. F. Sirianni, and I. E. Puddington. *Canadian J. Technol.*, 31, 121–126 (June 1953).

Experimental data show that former theories relating to the rheological properties of grease-like dispersions of soaps (especially those of Na and Li) in hydrocarbon oils must be discarded. The temp. dependence of the coefficient of thixotropy of such systems (which is greatly reduced by violent shearing, e.g. in a colloidal mill) cannot be explained in terms of mechanical chain entanglement or interfacial surface tension. Once broken down thixotropy is slow to return, but it may be recovered rapidly if the dispersion is heated to the temp. at which the soap begins to imbibe oil (corresponding to a phase change involving a large density difference in the soap); this indicates that thixotropy is associated with the agglomeration of soap particles by sintering to form bonds which are temp. dependent. Systems in which the disperse phase is not a soap (actually silica, and a form of bentonite) show less temp. dependence in their thixotropy, though this depends markedly on the nature of the particle surfaces.

J. W. D.

"Heavy-metal" Content of Gelling and Stabilising Agents. J. C. Bartlett, E. List, M. Page, and R. A. Chapman. *Canadian J. Technol.*, 31, 146–153 (June 1953).

The sampling and analytical methods by which various gelling and stabilising agents have been examined for their As, Pb, Zn, and Cu contents are described, the sampling technique being discussed at length; a special tool was designed to ensure representative sampling. The amounts of these metals found in samples of the following substances are reported—agar, gelatin, carrageen moss, sodium pectate, sodium alginate, liquid pectin, gum karaya, gum arabic, locust-bean gum, sodium carboxymethyl cellulose, and methyl cellulose. One sample of locust-bean gum alone gave > 2 p.p.m. of As. A stabilising mixture (the composition of which is given only approximately) and one sample of sodium alginate contained excessive amounts (25 and 38 p.p.m. respectively) of Pb.

J. W. D.

Researches on Starches. LIV—Chromatographic Fractionation of Starches. E. H. Fischer and W. Settele. *Helv. Chim. Acta.*, 36, 811–819 (June 1953).

Chromatographic fractionation on alumina columns in aqueous medium of synthetically prepared mixtures of tapioca amylose and amylopectin, as well as of natural starches of maize, potato, and tapioca, indicate that the relatively weak affinity of neutral alumina for starch constituents is stronger than that of acid alumina. Favourable conditions are determined for a selective separation of the two constituents of starch. Amylopectins afford several sub-fractions, but amyloses give only one except tapioca amyloses, where two are obtained.

H. H. H.

Sedimentation of Alginic Acid Powder in Electrolyte

Solution. S. Miyamoto and T. Sasaki. *Bull. Chem. Soc. Japan*, **26**, 228-231 (July 1953).

The sedimentation volume and swelling of alginic acid in electrolyte solutions has been measured and coagulation degrees calculated. The coagulation degree showed large values, giving maxima at low concentrations of FeCl_3 and $\text{Th}(\text{NO}_3)_3$. These maxima corresponded to the isoelectric points shown on the electrokinetic potential curve. A close correlation between coagulation degree, electrokinetic potential, and cation exchange was observed.

W. R. M.

cycloPolysiloxanes from Ethyldichlorosilane.

R. Okawara, E. Asada, and T. Watase. *Bull. Chem. Soc. Japan*, **26**, 141-143 (April 1953).

PATENTS

Detergents. Procter & Gamble Co. *USP* 2,626,264

The complex mixture of sulphonates obtained by sulphonating high molecular diesters of carbonic acid, e.g. dodecylallylcarbonate $\text{C}_{12}\text{H}_{25}\text{O}-\text{CO}-\text{O}-\text{CH}_2\text{CH}_2\text{CH}_3$, are effective detergents in hard water. C. O. C.

Non-caking Sulphonate Detergent. California Research Corp. *BP* 698,620

A non-caking detergent is composed of an alkali metal monoalkylbenzene sulphonate (5-40 parts by wt.) and alkylsulphate (95-60). C. O. C.

Surface-active Composition. Allied Chemical & Dye Corp. *USP* 2,626,244

The surface-active properties of nitrosation-sulphonation products, e.g. those described in *USP* 2,265,993, 2,336,387 and 2,313,719, are increased in presence of cation-active organic nitrogen products containing 1 N atom and 20 C atoms of which 6-4 C are in an open carbon chain attached to the N and < 7 of the remaining C atoms are attached to the N.

8-Hydroxyquinoline as Stabiliser for Persalts. Lever Brother & Unilever. *BP* 698,272

8-Hydroxy quinoline is an effective stabiliser for persalts, e.g. Na perborate or percarbonate, in washing and bleaching compositions. Usually 0.05-0.25% on the weight of the persalt is used. C. O. C.

Auxiliary Agents for Textiles and Leather. Basf. *BP* 698,636

The condensates obtained by heating components of formula $\text{A}-(\text{OC}_2\text{H}_5)_n\text{B}$ (A = aliphatic hydrocarbon with a chain of > 3 C; B = OH, ONa, OK, or the radical of an inorganic acid; $n = > 0$) with an aromatic acid or phenol or a functional derivative thereof substituted by at least one amino or nitro group, any nitro groups in the condensates being finally converted into amino groups, in many cases very high foaming, wetting, dispersing and antiseptic properties. C. O. C.

Hydroxypropylated Allyl Starch. Petrolite Corp. *USP* 2,626,937-8

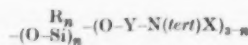
The products obtained by the hydroxypropylation of organic solvent-soluble allyl starch or polymerised allyl starch (using 5-50 parts by wt. of propylene oxide per 1 part allyl starch derivative) or the polycarboxylic acid esters of such products are useful as wetting, detergent emulsifying and levelling agents. They are hydrophilic and can be used in water-repellent finishes. C. O. C.

Water-soluble Modified Urea-Formaldehyde Resins. American Cyanamid Co. *BP* 697,801

Products of use for rendering textiles crease- and shrink-resistant and for treating leather are obtained from urea (1 mol.), formaldehyde (1.5-3.0 mol.) and a compound of formula $\text{NH}_2(\text{CH}_2)_n\text{OSO}_2\text{X}$ ($n = 1-6$; X = H, Li, K, Na, NH_4 , and $\text{NHR}^1\text{R}^2\text{R}^3$ ($\text{R}^1\text{R}^2\text{R}^3$ = same or different Alk of 1-3 C)) (0.015-0.25 mol.) by heating the urea with the formaldehyde under alkaline conditions and then adding the third component and continuing heating under either alkaline or acid conditions. Finally the mixture is cooled and kept under acid conditions until a 45% solids soln. thereof in water is at least B on the Gardner-Holdt scale. C. O. C.

Quaternary Ammonium Salt Derivatives of Alkyl Alkoxy Silicon Compounds.—Finishing Agents.

Deering Milliken Research Trust. *USP* 2,637,623
Compounds of formula $\text{R}_n\text{Si}(\text{O}-\text{Y}-\text{N}(\text{tert})\text{X})_{4-n}$ ($n = 1, 2$ or 3, R = same of different, sat. or unsat., sub. or unsub., aliphatic, aromatic or cycloaliphatic group or an



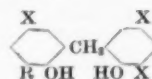
($y = 1-20$); Y = a di- or trivalent organic radical or a radical containing an ester, ether, amide, carbamate or urea linkage; N(tert) = residue of a tertiary amine) are useful for imparting lasting water-repellency and/or softness, dimensional stabilisation, flame resistance and crease resistance to textiles. C. O. C.

Ethylene - Alkyl Acrylate - Alkylbutene-1:4-dioic Acid Esters—Films and Coating Agents. DuP. *BP* 698,007

Polymers of ethylene, an alkyl acrylate and a mono-alkyl butene-1:4-dioic acid ester can be cured or cross linked and can be used for making films, coating textiles, etc. C. O. C.

3-Alkyl-2:2'-dihydroxy-3':5:5'-trihalogenodiphenylmethanes—Bactericides and Fungicides. Dow Chemical Co. *BP* 698,536

Compounds of formula—



(R = propyl or butyl; X = Br or Cl) have strong bactericidal and fungicidal properties. They are insoluble in water but soluble in aqueous alkali and are suitable for inclusion in surgical dressings and in rubber goods. C. O. C.

Insect Repellents. U.S. Secretary of the Army. *USP* 2,627,487

Compounds of formula $\text{R}_{12}\text{NCO}-\text{C}_n\text{H}_{2n-1}\text{COOR}^2$ (R^1 and R^2 = same or different hydrocarbon residues; $n = > 1$; $x = 1$ or 2) when impregnated into fabrics effectively repel mosquitoes.

USP 2,627,489-90

Compounds of formula $\text{HO}-\text{R}^3-\text{OAc}$ (R = residue of a paraffin having an open or closed chain; Ac = acyl residue of a sat. fatty acid of 3-7 C; $\text{R} + \text{Ac} = > 8$ C) and



(Y = aliphatic acyl; Z = H or CH_3 ; R = straight chain Alk) have similar properties. C. O. C.

Water Impermeable, Water Vapour Permeable Coating (X p. 517).

IV—RAW MATERIALS; INTERMEDIATES; COLOURING MATTERS

Reflections on Liebig's Call to British Chemists at the Liverpool Meeting in 1837, together with Observations on the Nature of City Smoke. G. R. Clemo. *Chem and Ind.*, 957-964 (12 Sept. 1953).

This paper is the Presidential Address to Section B (Chemistry) delivered at the annual meeting of the British Association for the Advancement of Science at Liverpool on 3rd Sept. 1953. It deals with some consequences of Liebig's challenge at the 1837 meeting, which briefly reads, "I trust that Englishmen of science will participate in the general movement and unite their efforts to those of the chemists of the Continent, to further the advance of organic chemistry." Those dealt with are—the establishment of the Royal College of Chemistry in London in 1845 with A. W. Hofmann as Director, the work of W. H. Perkin Senr., the early contribution of Manchester, and the subsequent development throughout the country generally. The tremendous industrial developments since 1914 are noted, with their consequent demand for scientists of all kinds and with the concomitant dearth of science teachers in schools. The study of chemical microbiology is stated to be probably our greatest need at the present time. The author finally indicates how ^{14}C has been used to gain a further insight into the mechanism whereby melanin pigments are formed from tyrosine, and he then describes some experiments to ascertain the composition of Newcastle smoke, in view of the fact that cancer in the respiratory system is on the increase. He remarks that could Liebig return to-day he would surely exclaim that this country

"has surpassed all his notions." The great advances in industrial organic chemistry alone are almost too numerous to mention, but outstanding among the discoveries are Caledon Jade Green and the phthalocyanines among the colouring matters, with Perspex, polythene, Terylene, and Ardil among the plastics and fibres. H. H. H.

Bond-orders in Aromatic Compounds. G. M. Badger and H. A. McKenzie. *Nature*, **172**, 458-459 (5 Sept. 1953).

There is a smooth-curve relationship between aromatic bond-orders and the "corrected" redox potentials of the corresponding *o*-quinones; the latter may be fairly readily determined. The method has been applied to pyrene (I) and 3:4-benzopyrene (II). The bond-orders of the 1:1 bond in (I) and the 6:7 bond in (II) have been evaluated from the redox potentials of pyrene-1:2-quinone and 3:4-benzopyrene-6:7-quinone respectively; they agree closely with values calc. by the method of mol. orbitals. Results obtained from phenanthra-9:10-quinone and 1:2-benzanthra-3:4-quinone show similar agreement. Though the method is not valid for substituted aromatic cpd., the redox potential of 9-methyl-1:2-benzanthra-3:4-quinone indicates that the 3:4 bond in 9-methyl-1:2-benzanthracene has a greater charge than in 1:2-benzanthracene itself; this is in accordance with theoretical predictions. The experimental procedure is described. J. W. D.

Nitration in Sulphuric Acid. IX—Rates of Nitration of Nitrobenzene and Pentadeuteronitrobenzene. T. G. Bonner, F. Bowyer, and G. Williams. *J.C.S.*, 2650-2652 (Sept. 1953).

Rates of nitration of nitrobenzene and pentadeuteronitrobenzene in 97.4% and 86.7% H_2SO_4 are practically identical, and confirm Melander's demonstration (*Arkiv. Kemi*, **2**, 211 (1950)) that breakage of the C-H bond is not part of the rate-determining step in aromatic nitration. H. H. H.

Mesomeric Effect of the Sulphonic Acid Group. H. Zollinger. *Nature*, **172**, 257-258 (8 Aug. 1953).

A study of the acidity constant and calc. σ -values for aniline, metanilic acid, sulphanilic acid, phenol, *m*- and *p*-phenolsulphonic acids, benzoic acid, and *m*- and *p*-sulphobenzoic acids indicates that there is a conjugative effect between the sulphonic acid group and the aromatic nucleus. The σ atom in sulphonic acids appears to be capable of extending its octet to a decet or dodecet structure. The σ -values for *m*- and *p*-sulphonic groups, unlike those for electrically neutral groups, depend in high degree upon the ionic strength. J. W. D.

Reactions of Sulphonic Esters. I—Kinetic Study of the Effect of Substituents upon a Series of Sulphonic Esters. R. E. Robertson. *Canadian J. Chem.*, **31**, 589-601 (June 1953).

Carbodiimides. II—Reaction of Sulphonic Acids with Carbodiimides. A New Method of Preparation of Sulphonic Anhydrides. H. G. Khorana. *Canadian J. Chem.*, **31**, 585-588 (June 1953).

Synthesis of 2-Alkyl-3-hydroxypyridines. W. Gruber. *Canadian J. Chem.*, **31**, 564-568 (June 1953).

Effect of Methyl Substitution on Absorption Maxima of Quinoline Derivatives. K. Shibata and T. Homma. *Bull. Chem. Soc. Japan*, **26**, 76-78 (Feb. 1953).

An empirical rule is suggested governing the relationship between the position of substitution and the shift of the absorption band. In some quinoline derivatives methyl substitution causes a hypsochromic shift of absorption band, contrary to prevailing theories. W. R. M.

Polynuclear Heterocyclic Systems. VII—Syntheses using the Elbs Reaction. G. M. Badger and R. Pettit. *J.C.S.*, 2774-2778 (Sept. 1953).

Pyrolysis by the Elbs reaction of 3-*o*-toluylquinoline gives 5:10-dihydro-2:3-benzacridine, while 2-(2-methyl-1-naphthoyl)pyridine gives 9-hydroxy-8-aza-1:2-benzanthracene. In the cases of 2- and 4-*o*-toluylpyridine, and of 3-(2-methyl-1-naphthoyl)pyridine, extensive decomposition occurs and no pure product can be isolated. The mechanism of the Elbs reaction, for which no catalyst has been found, is discussed, and a free-radical mechanism is proposed owing to the high temperature required. H. H. H.

Reactions with Dry Alkaline-earth Hydroxides.

IV—New Method for the Preparation of Aniline.

J. Datta. *J. Indian Chem. Soc.*, **30**, 71-74 (Jan. 1953).

Nitrobenzene is reduced to aniline in 54% yield by passing its vapour over a mixture of 20% sulphur and 80% calcium hydroxide at 200°C. A. J.

Preparation of Phenylhydrazine by Electrolytic Reduction of Diazonium Compounds. P. Rüetachi and G. Trümpler. *Helv. Chim. Acta*, **36**, 1649-1658 (Sept. 1953).

A special apparatus is described whereby electrolytic reduction of diazonium compounds to arylhydrazines in good yield is accomplished, and the side reaction between the arylhydrazine and diazonium salt prevented. The latter is the chief cause of the failure of previous electrolytic methods. Mercury is found to be the most suitable cathode material. H. H. H.

Cleavage by means of Diazonium Compounds.

XIII—Phenol Derivatives. E. Ziegler and G.

Snatzke. *Sitzungsber. Öster. Akad. Wiss.*, **162**, (3-4), 278-286 (1953).

Cleavage of certain phenols by benzenediazonium chloride (I) and by *p*-nitrobenzenediazonium chloride (II) affords evidence in favour of an extension of Ziegler's theory that fission is facilitated by a side-chain possessing a β -hetero atom, to include the influence of a phenolic hydroxyl group. 13 Examples are given including the cleavage of 4-hydroxybenzhydrol by I to 4-hydroxyazobenzene and benzaldehyde, and of diphenylacetophenone or benzaurine by II to 2:4-bis-*p*-nitrophenylazophenol. The various reactions are discussed. H. H. H.

Cleavage by means of Diazonium Compounds.

XIV—Aniline Derivatives. E. Ziegler and G.

Snatzke. *Sitzungsber. Öster. Akad. Wiss.*, **162**, (5-6), 610-618 (1953).

Benzenediazonium chloride is found to react with very few *p*-substituted anilines, e.g. with 1:4-dimethylaminobenzhydrol to give 4-dimethylaminoazobenzene and benzaldehyde, and also with Mischler's hydrol to give Butter Yellow (*C.I.* 19), but a large number are cleaved by [*p*-nitrobenzenediazonium chloride (cf. preceding Abstract of XIII), e.g. Malachite Green (*C.I.* 657) to give 4-dimethylamino-4'-nitroazobenzene and 4-dimethylaminobenzophenone. 19 Examples are included. The nature and steric effect of substituent groups can influence the course of the cleavage. H. H. H.

Oxidation of Phenylhydrazones with Perphthalic

Acid. B. M. Lynch and K. H. Pausacker. *J.C.S.*,

2517-2519 (Sept. 1953).

Benzaldehyde phenylhydrazone reacts with perphthalic acid in ether to give benzylazoxybenzene. Similar oxidation occurs with the following substituted benzaldehyde phenylhydrazones—3-, 4-, 3', and 4'-methyl; 3-, 4-, 3', and 4'-methoxy; 3-, 4-, 3', and 4'-chloro; 3-, 4-, and 3'-nitro; 4'-bromo-; and with benzaldehyde β -naphthylhydrazone. H. H. H.

Photo-dichroism in Solid Solutions of *p*-Nitroso-

dimethylaniline in Polystyrene. W. Kuhn and

H. Fehr. *Helv. Chim. Acta*, **36**, 1025-1058 (Aug. 1953).

A description is given, with full experimental details and mathematical treatment, of the dichroism which results when solid solutions of *p*-nitrosodimethylaniline in polystyrene are irradiated with linearly polarised light. The dependence of the dichroism on exposure period and wave-length is measured, and interpretation of the data found to be bound up with the production of decomposition products. H. H. H.

Dichroisms of *s*-Trinitrobenzene-Anthracene and

4:4'-Dinitrodiphenyl Diphenyl. K. Nakamoto.

Bull. Chem. Soc. Japan, **26**, 70-72 (Feb. 1953).

Dichroism of the compounds *s*-trinitrobenzene-anthracene and 4:4'-dinitrodiphenyl-diphenyl have been measured in the visible and the ultraviolet. The dichroism of the former indicates a typical molecular compound. Dichroism of the latter suggest no special attraction in the direction normal to the molecular plane of the dinitrophenyl. W. R. M.

Physicochemical Studies on Molecular Compounds.

III—Vapour Pressures of Diphenyl, 4:4'-Dinitrodiphenyl, and Molecular Compound between them. S. Seki and K. Suzuki. *Bull. Chem. Soc. Japan*, **26**, 209-213 (July 1953).

Investigation of the Coupling Reaction. V—The Reactivity of Undissociated Phenol. Couplings in Sulphuric Acid of High Concentration. H. Zollinger. *Helv. Chim. Acta*, **36**, 1070-1073 (Aug. 1953).

Diazotised 2:4-dinitroaniline is coupled with α -naphthol in different strengths of H_2SO_4 , and the reactivity of the undissociated naphthol, which is not measurable at low acidities because of the predominant naphtholate coupling is established within the range of 73-81% H_2SO_4 .

H. H. H.

Direct Cotton Dyes derived from Cyanuric Chloride.

II—Influence of the Triazine Ring on the Properties of Dyes. H. Iida. *J. Chem. Soc. Japan, Ind. Chem. Sect.*, **55**, 24-6 (1952); *Chem. Abs.*, **47**, 9618 (25 Sept 1953).

The colours of dyes prepared from Direct Blue 2B, carbonyl-J-acid and cyanuric-J-acid, by replacing H atoms of amino radicals with triazine, phenyl, benzoyl and acetyl radicals show that introduction of a triazine ring causes hypochromic effect less than that caused by introduction of an acetyl group.

C. O. C.

Preparation of Antibacterials from Organomercurials. VIII—Mercurated Azo Dyes from Diazotised Aniline.

S. S. G. Sircar and M. K. Rout. *J. Indian Chem. Soc.*, **30**, 361-363 (May 1953).

IX—Mercurated Azo Dyes from Diazotised Acetoxymercuri-aniline. Idem. *Ibid.*, 364-366.

X—Mercurated Azo Dyes from Diazotised Acetoxymercuri- β -chloroaniline. Idem. *Ibid.*, 366-368.

Solubility and Light Fastness of Azo Dyes—II.

A. B. Sen and R. C. Sharna. *J. Indian Chem. Soc.*, **29**, 931-933 (Dec. 1952).

The solubility of eleven phenylazophenols with substituents in the phenol residue has been measured in benzene, alcohol and ground-nut oil. Solubility in benzene and alcohol varies inversely with m.p. Solubility in benzene and oil is increased by substitution with alkyl and chloro groups and decreased by substitution with carboxyl and hydroxyl. Light fastness is increased by introduction of alkyl and decreased by chlorine.

A. J.

Relationship between the Structure of Triphenylbromomethane and its Colour.

J. Landais. *Bull. soc. chim. France*, **1953**, 648-655; *Chem. Abs.*, **47**, 9098 (25 Sept 53).

X-ray study of triphenylbromomethane, including interpretations based on Patterson projections and confirmed by Fourier-Brags diagrams, indicates that: (1) the molecule has threefold symmetry, (2) the Br atom is attached to the central C atom, (3) the valences linking the central C atom both to the Br atom and the aromatic nuclei form a tetrahedron flattened in the direction of C-Br, with the Br atom placed so as to yield three identical angles: Br-C (central atom)-C (aromatic nuclei) (4) the C-Br distance is ca. 2 Å, suggesting that the bond is more covalent than electrovalent; (5) in crystals the molecules seem to be associated in pairs, one being at 60° to the other, the two Br atoms being 3 Å apart.

C. O. C.

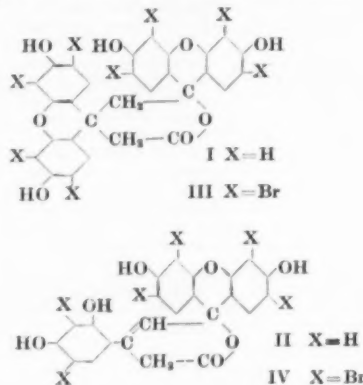
Physicochemical Studies of Organic Dyes in relation to Photochemistry. II—Influence of the Addition of Potassium Polyvinyl Sulphate on the Absorption Spectra and Fluorescence of Rhodamine 6G in Aqueous Solution. M. Kiozumi and N. Matage. *Bull. Chem. Soc. Japan*, **26**, 115-119 (April 1953).

Gradual addition of K polyvinyl sulphate to an aqueous soln. of Rhodamine 6G at first increases the extinction coefficient of the absorption peak at 500 m μ , corresponding to the dimer, while that at 526 m μ , corresponding to the monomer, decreases. When a certain concentration of salt is reached further addition leads to growth of the monomer band. The intensity of fluorescence gradually decreases until the same concentration of salt is reached, further addition leading to an increase in intensity. It is suggested that the effect is due to the change in aggregation caused by absorption of dye ions on the K polyvinyl sulphate.

W. R. M.

Dyes derived from Acetonedicarboxylic Acid. S. S. Baijal and J. D. Jewari. *J. Indian Chem. Soc.*, **20**, 75-78 (Jan. 1953).

Acetonedicarboxylic acid condenses with resorcinol at 200°C. to yield I (m.p. 210°C.). 7-Hydroxycoumarin-4-acetic acid (a possible intermediate) condenses with resorcinol to yield II (179°C.). Bromination of I gives an octabromo compound III, and of II gives a hexabromo compound IV. The structure of I is confirmed by condensing the dilactone of $\beta\beta$ -di-(2:4-dihydroxyphenyl)-glutaric acid with resorcinol at 180°C. II is confirmed by condensing β -(2:4-dihydroxyphenyl)glutaric acid with resorcinol.



A. J.

Syntheses of Cyanine Dyes. M. Pailer and E. Kuhn. *Sitzungsber. Öster. Akad. Wiss.*, **162**, (1-2), 85-92 (1953).

Syntheses of trimethin-, mero-, and rhoda-cyanine dyes are described which are derived from 1:8-naphthyridine, together with analogous quinoline derivatives, and their absorption spectra are compared. The second nitrogen in the naphthyridine ring system displaces the absorption maximum ~ 20 m μ . towards the longer wavelengths.

H. H. H.

Contribution to the Theory of Light Absorption of Symmetrical Polymethin Dyes. K. Fukui, C. Nagaka, and T. Yonegawa. *J. Chem. Phys.*, **21**, 186-7 (1953); *Chem. Abs.*, **47**, 9137 (25 Sept. 1953).

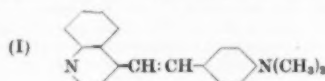
Kuhn's free-electron model (*Chem. Abs.*, **44**, 3354 (1950)) is modified by introducing small perturbing potential barriers between C-C and C-N atoms and adding them to the uniform field along the chain. Calculated wavelengths of maximum absorption are within the experimental error for the compounds measured by Brooker *et al.* (*Chem. Abs.*, **36**, 1936 (1942)).

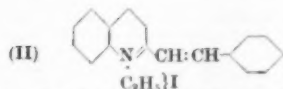
C. O. C.

Absorption Spectra of Molecular Complexes of Aromatic Amines with Quinolinium Salts—The Complex [4-(p -Dimethylaminostyryl)-quinoline + 1-Ethyl-2-styrylquinolinium Iodide].

V. A. Izmailsky and P. A. Solodkov. *Doklady Akad. Nauk S.S.S.R.*, **91**, 1119-1122 (11 Aug. 1953).

The effect previously demonstrated for a pair of 2-styrylquinoline derivatives (see J.S.D.C., **67**, 198 (May 1951))—a bathochromic shift of the absorption max. when two compounds form a molecular complex—is demonstrated for a complex between a 4-styryl- and a 2-styryl-quinoline deriv. (I and II). As anticipated, the longer the π -electron system in the new complex increases the bathochromic shift (by 25 m μ). For methanol soln. containing I and II in equimolecular ratio—at 10^{-5} M. the absorption max. is that of I (402 m μ), indicating complete dissociation of the complex; at 10^{-4} M. it is at 530 m μ ; and with further increase in concn the position of the max. remains const., but the molar extinction coeff. rises as equilibrium moves over in favour of the complex.

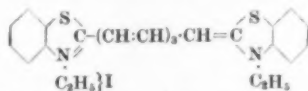




A. E. S.

Effect of Gelatin on the Thermal Decolorisation of Tricarboyanine Dyes, and the Chemical Nature of the Accelerator Component of Gelatin. Yu. Sh. Moshkovsky and A. L. Karpova. *Doklady Akad. Nauk S.S.S.R.*, **91**, 299-300 (11 July 1953).

A study is made of the thermal decomp. in soln. of the dye—



When gelatin is present, decomp. is retarded to an extent that is directly related to the emulsion-ripening propensity of the specimen of gelatin. The presence of a thiosulphate has the same effect as the accelerator component of gelatin on the decomp. of the dye and on ripening and related phenomena, and it is concluded that the accelerator component is a thiosulphate or related inorganic compound.

A. E. S.

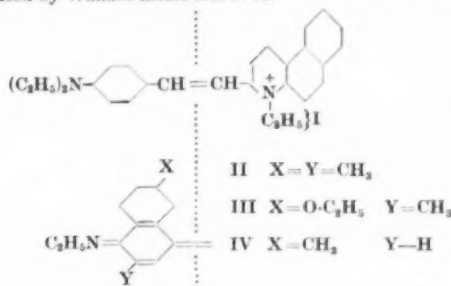
Absorption Spectra of Styryl Dyes. K. Shibata. *Bull. Chem. Soc. Japan*, **26**, 105-108 (Feb. 1953).

Absorption maxima are given for six styryl dyes in ethanol. These are compared with values calculated from the theory of Herzfeld and Sklar. Agreement is fairly good showing that the theory may be applied to cases of asymmetric conjugated systems. It is suggested that the absorption bands of styryl dyes in the visible region are due to the transition between electronic levels and not to the transition between split levels of one electronic level caused by vibration splitting.

W. R. M.

Cyanine Dyes from β -Naphthaquinoline. M. Q. Doja and S. M. Sanyal. *J. Indian Chem. Soc.*, **30**, 261-268 (April 1953).

Condensation of β -naphthaquinoline with *p*-dimethylaminobenzaldehyde in the presence of piperidine yields I, and with *p*-toluidine, 6-ethoxyquinoline ethiodide or *p*-toluidine ethiodide in the presence of alcoholic KOH yields II, III or IV respectively. All four dyes act as photographic sensitizers in the range 5000-7400 Å. for I, and 5100-6500 Å. for II, III and IV. The fluorescence colours in alcohol are given for exciting light produced by Wallace filters No. 1-10.



A. J.

Dichroisms of Benzene Rings. IV—Dichroisms of Diphenyl-diacyetylene and Naphthazarin. K. Nakamoto. *Bull. Chem. Soc. Japan*, **26**, 172-174 (June 1953).

Absorption spectra of diphenyldiacyetylene and naphthazarin have been measured quantitatively in the visible and the ultraviolet. The acetylene group shows similar, though greater, dichroism to that of the benzene ring. It is concluded that naphthazarin exists as the monomer and does not form a molecular compound like quinhydrone.

W. R. M.

Arylaminoalazarin Derivatives. R. P. Gonsalves, A. N. Kothare, and V. V. Nadkarny. *J. Indian Chem. Soc.*, **27**, 479-83 (1950); *Chem. Abs.*, **47**, 2990 (25 March 1953).

A series of 4-arylaminoalazarins has been prepared by condensing an arylamine with 4-nitroalazarin. The shades produced on Al-mordanted cotton are listed. Each

arylamino compound has also been converted to the corresponding dibenzoyl derivative and dyed on cotton from a sodium silicate vat.

R. K. F.

Sulphenic and Selenenic Acids and some Derivatives. IV—Addition of Selenenyl Acetates to Olefins. W. Jenny. *Helv. Chim. Acta*, **36**, 1278-1282 (Sept. 1953).

It is shown that anthraquinone-1-selenenyl acetate easily adds to cyclohexene to form 1-(2'-acetoxy-cyclohexylselenenyl)-anthraquinone. An analogous addition takes place between anthraquinone-1-selenenyl acetate and styrene, and also between 1-methoxyanthraquinone-4-selenenyl acetate and cyclohexene. The syntheses of the corresponding sulphur compounds are described. This addition of selenenyl acetates to olefins appears to be a general reaction.

H. H. H.

Acedianthrone Dyes. K. Inukai and T. Ueda. *Repts. Govt. Chem. Ind. Research Inst. Tokyo*, **47**, 21-5 (1952); *Chem. Abs.*, **47**, 2989 (25 March 1953).

4:12-Dichloroacedianthrone, a red vat dye, was prepared by condensing 1-chloroanthrone with chloral in H₂SO₄ containing SnCl₄ and copper acetate, and the intermediate bis(4-chloro-9-anthraquinonylidene)-ethane, itself a yellow dye further condensed in benzoyl chloride.

R. K. F.

Pyrazoleanthrone Dyes. T. Maki and T. Akamatsu. *J. Chem. Soc. Japan*, Ind. Chem. Sect., **54**, 281-3 (1951); *Chem. Abs.*, **47**, 2989 (25 Mar. 1953).

Ethylation of pyrazoleanthrone with ethyl *p*-toluene sulphonate produces two *N*-ethyl tautomers, one of which having an *o*-quinonoid structure gives a red dye on fusion with KOH, while the other with a *p*-quinonoid structure does not. Identical with this red dye is Indanthren Rubine R. and one of the tautomers obtained by ethylation of the disodium salt of Pyrazoleanthrone Yellow. The other tautomer from Pyrazoleanthrone Yellow is an orange dye.

R. K. F.

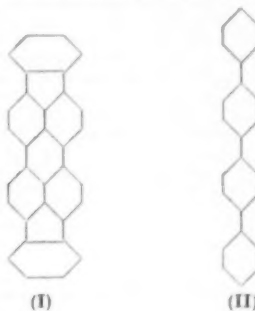
1:1'-Difluorodanthron-9-ylidene and an attempted Synthesis of 4:4'-Dibromodanthron-9-ylidene. E. D. Bergmann and H. J. E. Loewenthal. *J.C.S.*, 2572-2574 (Sept. 1953).

1:1'-Difluorodanthron-9-ylidene (I) is synthesised from 4-fluoroanthrone as initial material, and found to be thermochromic since OCH₃, Br, and CH₃ in 1:1'-positions destroy the thermochromism of I whereas F does not, it follows that the thermochromism is dependent on the volume of the substituents. The synthesis of 4:4'-dibromodanthron-9-ylidene is thwarted by the surprising lability of the Br atoms, which instability may perhaps be due to the existence of zwitterionic forms.

H. H. H.

Decomposition of Periflanthene to Quaterphenyl. A. Zinke and L. Ammerer. *Sitzungsber. Oster. Akad. Wiss.*, **162**, (3-4), 422-424 (1953).

Oxidation of periflanthene (I) by Na₂Cr₂O₇ and CH₃COOH in boiling nitrobenzene gives a mixture of 3 quinones and an acid, the latter being also given by energetic oxidation of the quinones. This acid when sublimed gives a diketone from which distillation with soda lime or Zn dust affords quaterphenyl (II).

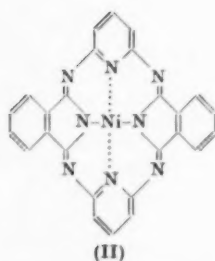
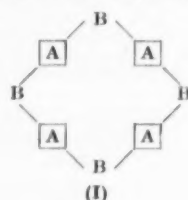


H. H. H.

Discoveries among Conjugated Macrocyclic Compounds. R. P. Linstead. *J.C.S.*, 2873-2884 (Sept. 1953).

This, the 13th Pedler Lecture of the Chemical Society, is concerned with macrocyclic compounds containing rings

of 16 or more atoms with either perfectly conjugated or cross-conjugated systems of double and single bonds. The simplest conjugated macrocycles known are those in which 4 cyclic units A are joined by linking atoms B to make the large ring (I); A and B must be of such a type as to permit conjugation. The group is of the highest importance and includes chlorophyll, haemin, and the other natural porphyrin pigments, whilst the widely distributed and vitally important iron-containing enzymes contain prosthetic groups based on the same structural patterns. The lecture deals mainly with aza-linked macrocycles where B is $-N=$. The phthalocyanines are first discussed and the coincidence between the chemical and physical pictures of the molecule summarised in Crowfoot's arresting phrase: "This pattern may be said to provide the first purely physical demonstration of the truth of organic chemistry". Basic structures connecting phthalocyanine and porphyrin are then considered, and the remarkable and characteristic properties of the tetrazaporphyrins described, including the fluorescence and catalytic performance of the metallic varieties. Other types of conjugated macrocycles are mentioned for which aminopyridines have been used as secondary components; such compounds extract metals from their salts with formation of metallic complexes, e.g. with Ni (II), a complex which is considered at length. Some directions in which further research is desirable are (1) the exploration of the possible range of structure; (2) the rationalisation of reactions in view of the remarkably easy biosynthesis of porphyrins; and (3) the catalytic properties and oxidation-reduction behaviour of macrocycles. 39 References, and 7 diagrams.



H. H. H.

Different States of Chlorophyll in Leaves. A. A. Krasnovsky and L. M. Kosobutskaya. *Doklady Akad. Nauk S.S.S.R.*, **91**, 343-346 (11 July 1953).

The formation of chlorophyll during the irradiation of etiolated leaves is followed by spectrophotometric measurements on colloidal solutions prepared from samples taken at intervals and also by other measurements, and it is shown from this and other evidence that the monomeric chlorophyll first formed is present mainly as a protein-lipid complex (absorption max. 670 mμ), and that aggregation then occurs giving a protein-lipid complex having a max. at 678 mμ. (the usual chlorophyll of plants). It is the monomeric form, the equilibrium content of which increases with rise in temp., that is active in photosynthesis; the general mechanism of this process is discussed. A. E. S.

Spectral Properties of the Reduced Forms of Chlorophylls a and b. V. B. Evstigneiev and V. A. Gavrilova. *Doklady Akad. Nauk S.S.S.R.*, **91**, 899-902 (1 Aug. 1953).

A study is made of the absorption and fluorescence spectral characteristics of the red substances formed when chlorophylls a and b are reversibly reduced by phenylhydrazine in toluene soln. It is considered that the

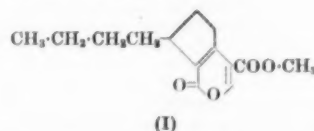
products are semiquinones, and the spectral changes occurring when pyridine is added indicate that these are present as equilibrium mixtures of dissociated and undissociated forms. Irradiation of the reduced forms leads to pheophytinisation (loss of Mg). A. E. S.

Flavonoid Glycosides of *Dahlia Variabilis* I—General Introduction. Cyanidin, Apigenin, and Luteolin Glycosides from the Variety "Dandy". C. G. Nordström and T. Swain. *J.C.S.*, 2764-2773 (Sept. 1953).

The sap-soluble pigments responsible for flower colour in *Dahlia variabilis* are reviewed, and a micro-method for identification of flavones and their glycosides is described. By its means the flowers of the purple-blue dahlia "Dandy" are found to contain—apigenin and its 4'- and 7-mono-glucosides and 7-rhamnoglycoside; luteolin 5-mono-glucoside and 7-diglucoside; cyanidin arabinoglucoside; and some mixer compounds including an aglycone indistinguishable from pelargonidin. H. H. H.

Constitution of Fulvoplumierin—II. H. Schmid and W. Beazee. *Helv. Chim. Acta*, **36**, 1468-1489 (Sept. 1953).

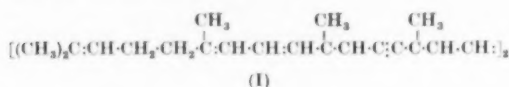
By partial hydrogenation of fulvoplumierin (I), an orange pigment from the rind of *Plumiera acutifolia*, to tetra-, hexa-, isohepta-, and octa-hydrofulvoplumierins, its constitution (I) has been established as 5'-carbomethoxy-3':4':1:2-cumallno-w-propenylfulvene.



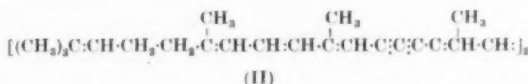
H. H. H.

Carotenoid Synthesis. XII—Bis-dehydro-lycopenes and totally Synthetic *cis*-Lycopines. C. F. Garbers and P. Karrer. *Helv. Chim. Acta*, **36**, 828-834 (June 1953).

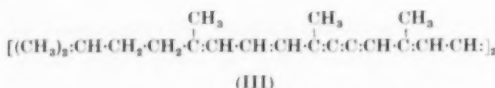
Dehydration of 2:6:10:14:19:23:27:31-octamethyldotriacontahpta-2:6:8:16:24:26:30-en-di-12:20-in-tetra-10:14:19:23-ol by heating in toluene with *p*-toluenesulphonic acid gives a mixture of 3 orange pigments styled bis-dehydro-lycopenes (I), (II), and (III), which are chromatographically separated on alumina. Bis-dehydro-lycopenes b and c reduce with hydrogen (Pd catalyst) to three *cis*-lycopenes, whereas bis-dehydrolycopenes a gives a di-*cis*-lycopenes. All are relatively unstable.



(I)



(II)

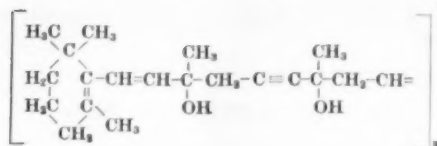


(III)

H. H. H.

Carotenoid Syntheses. XIII—Two Isomeric *cis*-β-Carotenes with *cis*-Configuration at Hindered Double bonds. C. H. Eugster, C. F. Garbers, and P. Karrer. *Helv. Chim. Acta*, **36**, 1378-1383 (Sept. 1953).

A bisdehydro-β-carotene or a mixture of such carotenes are obtained by removal of water from the polyene diacetylene tetrasol (I) by anhydrous *p*-toluenesulphonic acid in boiling toluene. Reduction affords two *cis*-β-carotenes with *cis*-configuration at sterically hindered double bonds, which are transformed to *trans*-β-carotene by heat or by iodine in cyclohexane.



H. H. H.

Action of N-Bromosuccinimide on β -Carotene.

L. Zeichmeister and L. Wallcave. *J. Amer. Chem. Soc.* **75**, 4493-5 (20 Sept. 1953).

β -Carotene when refluxed with N-bromosuccinimide yields a complicated mixture of pigments from which three compounds have been isolated in pure state, viz. dehydro- β -carotene, $\text{C}_{40}\text{H}_{52}$, bisdehydro- β -carotene, $\text{C}_{40}\text{H}_{48}$, and a pigment seemingly identical with anhydro-escholtz-xanthin, $\text{C}_{40}\text{H}_{48}$. Some spectral and stereochemical observations are discussed.

C. O. C.

Conversion of Dehydro- β -carotene, via its Boron Trifluoride Complex, into an Isomer of Cryptoxanthin.

L. Wallcave and L. Zeichmeister. *J. Amer. Chem. Soc.* **75**, 4495-8 (20 Sept. 1953).

Dehydro- β -carotene and BF_3 -etherate form a dark blue complex. Cleavage with water or methanol resulted in isolation of a monohydroxy- β -carotene, termed *isocryptoxanthin* (or its methyl ether). *isocryptoxanthin* when treated with acid chloroform is dehydrated to dehydro- β -carotene indicating presence of an allylic hydroxyl group. Natural cryptoxanthin is 3-hydroxy- β -carotene but *isocryptoxanthin* is the corresponding 4-compound. Its methyl ether or acetate can be also converted into dehydro- β -carotene.

C. O. C.

Purple Pigment and Protein in the Threads of the Sea Anemone, *Adamsia rondeleti*.

A. Christomanos. *Nature*, **171**, 886-887 (16 May 1953).

Structure of Tyrosine Melanin.

R. I. T. Cromartie and J. Harley-Mason. *Chem. and Ind.*, 972-973 (12 Sept. 1953).

A comparative spectroscopic study of the oxidation by O_2 of 5:6-dihydroxyindole and of the 5-methyl and 2:3- and 4:7-dimethyl derivatives has afforded the following results: (a) Insoluble melanin-like pigments are obtained from 5:6-dihydroxy-indole and its 2-, 4- and 7-methyl derivatives; 3-methyl- and 4:7-dimethyl 5:6-dihydroxyindole give deep blue-violet pigments soluble in pyridine to intensely coloured solutions; and 2:3-dimethyl-5:6-dihydroxyindole gives an orange-red solution containing 2:3-dimethyl-indole-5:6-quinone, which is stable to further oxidation. (b) Oxidation proceeds rapidly and its results are not affected by the presence of tyrosinase. (c) Of the 3 nuclear methylated 3:4-dihydroxyphenylalanines, the oxidation of the 2- and 5- derivatives (the precursors of 4- and 7-methyl-5:6-dihydroxyindole), give melanine, but the 6-methyl derivative affords only a yellow-orange solution. These findings indicate that for melanin formation from 5:6-dihydroxyindoles, the 3- and either the 4- or 7-position must be free. Angeli's hypothesis of ring fission cannot be maintained.

H. H. H.

Human Visual Purple.

F. Crescitelli and H. J. A. Dartnall. *Nature*, **172**, 195-196 (1 Aug. 1953).

Visual purple is extracted from a newly removed human eye and examined spectrophotometrically, and results are compared with those previously obtained on lower animals.

J. W. B.

Lac Dye and its Lakes.

N. R. Kamath and S. P. Potnes. *Paint India*, **3**, (1), 107-114 (1953); *Chem. Abs.*, **47**, 9629 (25 Sept. 1953).

A simple method of isolating the dye is to extract the coarsely ground lac with 0.053% aq. Na_2CO_3 , convert into a Ca salt and then treat with HCl. The yield of Ca salt is 1.5% on the wt. of seed lac. The performance of various lakes particularly those of Pb or Pb in conjunction with Al, in surface coatings is evaluated, they seem to be suitable for plain and oil-bound distempers for interior use and in oil paints for both indoor and outdoor use.

C. O. C.

Development and Use of Pearl Essence Substitute.

R. L. Shuman. *Paint, Oil & Chem. Rev.*, **116**, (8) 22-3 (1953); *Chem. Abs.*, **47**, 9630 (25 Sept. 1953).

Precipitation of HgCl_2 under controlled conditions results in formation of minute crystals with a pearly lustre

resembling pearl essence made from fish scales and such a product is now widely used in plastics and finishes. Preparation of a lacquer from this product is described.

C. O. C.

Stabilising Effect of Trace Elements on Metal Sulphides used as Pigments.

A. Krause. *Przemysl Chem.*, **32**, 3-5 (1953); *Chem. Abs.*, **47**, 0927 (10 Sept. 1953).

Pigments such as CdS , Sb_2S_3 and ZnS undergo oxidative changes (whitening), especially under influence of H_2O_2 , with formation of sulphates. Certain trace elements can stabilise the space lattice, and so make the pigments more durable, by building trace amounts of stable complexes on their surface. Thus 0.1 g. of CdS is stabilised by 10^{-4} - 10^{-5} g. Fe^{+++} at 37°C., presumably by formation of a complex in the following manner—
 $\text{CdS} + \text{Fe}(\text{NO}_3)_3 + 6\text{H}_2\text{O} \rightleftharpoons [\text{CdFeS}(\text{H}_2\text{O})_6](\text{NO}_3)_2$
 Sb_2S_3 (0.1 g.) is stabilised by 10^{-2} g. $\text{Cu}^{++} + 10^{-3}$ g. Fe^{+++} ; the order in which these are added is important and either alone is not as good as the two together. ZnS (0.1 g.) is stabilised by 10^{-2} g. of Na^+ , Ba^{++} or Al^{+++} . Fe^{+++} and Co^{++} have no effect, while K^+ , Ni^{++} and Ca^{++} accelerate oxidation of ZnS by H_2O_2 at 37°C.

C. O. C.

Robert Holme, Citizen and Merchant of York. A Fourteenth Century Dyestuff Importer.

J. N. Bartlett. *J. Bradford Textile Soc.*, 97-100 (1952-53).

An account of the activity of a 14th century merchant who in 1382-3 was by far the largest importer of woad at Hull and who was a regular supplier of dyestuffs to dyers in various parts of the north. At his death in 1396 he bequeathed money to dyers in Pontefract, Barnsley and York. He was also a large exporter of wool cloth to Flanders. 26 references.

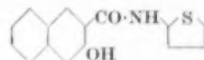
C. O. C.

PATENTS

2 - (3' - Hydroxy - 2' - naphthoylamino)thiophen—Azoic Coupling Component.

American Cyanamid Co. *USP* 2,625,542

2-Aminothiophene dissolved in benzene, is condensed with 3-hydroxy-2-naphthoyl chloride in presence of pyridine to produce the amide.



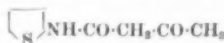
which couples with suitable diazotised imines to give azoic dyeings, prints and pigments. Thus it is padded on to cotton cloth from an alkali solution, and a blue azoic dye developed by immersing the cloth in a solution of diazotised 4-benzoylamino-2,5-diethoxyaniline.

E. S.

2-Acetoacetylaminio-thiophene—Azoic Coupling Component.

American Cyanamid Co. *USP* 2,625,541

2-Aminothiophene dissolved in ether, is condensed with diketene to form the acetoacetyl derivative



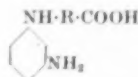
which couples with suitable diazotised amines to give azoic dyeings, prints and pigments. Thus it is mixed with the stabilised diazo compound prepared by reacting tetrazotised dianisidine with N-allylglycine and the mixture is thickened and printed on cotton. Development with hot acetic acid vapour produces a brownish orange print.

E. S.

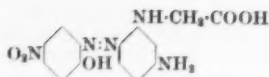
Metal-complex Monoazo Dyes for Nylon.

General Aniline. *USP* 2,624,653

The metal complexes of the monoazo dyes obtained by coupling a diazotised unsulphonated o-aminophenol with an amine



(R = $-\text{CH}_2-$, $-\text{CH}(\text{CH}_3)-$, or $-\text{C}(\text{CH}_3)_2-$; the benzene ring may contain alk dye nylon from a neutral or weakly acid bath, and build up to heavy shades. Thus diazotised 2-amino-4-nitrophenol is coupled under weakly acid conditions with m-aminophenylglycine to give the mono-azo compound



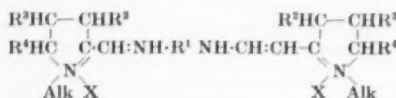
Treatment with ammoniacal nickel sulphate at 50–60°C. gives the metal complex which dyes nylon brown from an acid bath. E. S.

Disazo Leather Dyes. Basf. BP 697,709

Tetrazotised 2:6-diaminobenzene-4-sulphonic acid is coupled first under mineral acid conditions with 1 mol. of 2-amino-8-naphthol-6-sulphonic acid, and then under weakly acid or neutral conditions with 1 mol. of any other coupling component, containing at the most one sulpho group, to give disazo dyes for leather. The second azo component may be, e.g. β -naphthol or its 6-sulphonic acid, 3-methyl-1-phenyl-5-pyrazolone or its 3'-sulphonic acid, 2:4-dihydroxyquinoline, or 1:3-diketocyclohexane. Thus, using β -naphthol as the second coupling component, a bluish-red leather dye is obtained. E. S.

Polymethin Dyes. FH. BP 697,940

Dyes of formula



(R^1 = an aromatic radical; R^2 = H or Alk; R^3 and R^4 = same or different, H, Alk or Ar; X = radical of an inorganic acid) are obtained by condensing, in presence of an acidic condensing agent, especially conc. HCl, a suitable pyrrolidine or pyrroline derivative with an aromatic diamine. They are photographic sensitizers for the spectral field of short wavelength. C. O. C.

Caramel. Union Starch & Refining Co. BP 698,105

Caramelised sugar is treated with 1.5–3.0 times its volume a mixture of a monohydric alcohol of 1–2 C. and a monohydric alcohol of 2–6 C. together with ca. 15% of water. This gives very efficient separation of the colouring compounds, the tinctorial products of the resulting caramel being 3–5 times that of previously known commercial products and consists solely of caramelan and caramelen. C. O. C.

Highly-dispersed Red Lead. La Floridienne, J. Buttgenbach & Cie. BP 698,153

Minimum of particle size 1–0.5 micron and a surface: weight ratio never attained hitherto, is obtained by calcining the double carbonate of Pb and Na (probable formula $\text{Pb}_2(\text{CO}_3)_2(\text{ONa})_2$) prepared according to BP 691,028 at 400–450°C. to eliminate CO_2 and oxidise the resulting PbO to Pb_2O_3 , and then discharging the product into water, filtering, washing and drying and crushing the Pb_2O_3 . C. O. C.

Rutile Titanium Dioxide. Titangesellschaft. BP 697,673

Aq. $\text{Ti}(\text{SO}_4)_2$ containing 180–260 g./l. of TiO_2 is heated, preferably to the boil, until it becomes very turbid because of formation of colloidal titanium hydrate (but no hydrolytic precipitation of the filterable hydrate has occurred), it is then mixed with an aqueous liquid and the resulting hydrolysate calcined at 700–950°C. C. O. C.

Titanium Dioxide. Titan Co. BP 698,159

TiO_2 having free-flowing characteristics and of relatively high bulk density is obtained by introducing a 1:1 to 1:5 mixture of gaseous TiCl_4 heated to < 800°C. into a reaction zone externally heated to 900–1100°C. C. O. C.

Separating Particles Larger than Four Microns from Titanium Dioxide Slurries. American Cyanamid Co. USP 2,727,707

Particles > 4 micron are separated from a slurry of highly flocculated, calcined conditioned rutile TiO_2 (formed by calcining $\text{Ti}(\text{OH})_3$ in presence of 1% of ZnO or SnO_2) by adding an alkali metal silicate (0.4–1%, calculated as SiO_2 on the weight of TiO_2) agitating and centrifuging within 10 min. of the addition of the silicate. C. O. C.

Zirconium Pigments. National Lead Co. USP 2,626,255

Basic zirconyl lakes of acid dyes obtained by precipitating acid dyes at pH < 3.0 with water-soluble zirconium

salts are intensely coloured, insoluble, non-bleeding pigments. C. O. C.

Dyes and Dyeings in Nigeria (VIII p. 515).

V—PAINTS; ENAMELS; INKS

White Finishing Coats. H. W. Talen, T. Hoog and A. J. van Kuyk. *Verf. Inst. Circ.*, 74, 8 pp. (1952); *Chem. Abs.*, 47, 9630 (25 Sept. 1953).

Paints consisting of an oil primer and a white finishing coat made of oil-modified alkyd resin and a mixture of 80% linseed oil and 20% tung oil stand oil both pigmented with Pb titanite, ZnO and various types of TiO_2 , were treated after 2 yr. outdoor exposure on wood panels. Extensive data are given for chalking, cracking, powdering, resistance to mildew, adherence of dirt, and loss of gloss. Pb titanite in the resin was the most durable. Presence of ZnO promotes cracking. Resistance to chalking is best with rutile TiO_2 and worst with anatase. Paints in the oil vehicle lost their gloss much more rapidly than those in the resin vehicle. Addition of 60% ZnO to the pigment completely inhibits mildew formation. All the paints showed increase in consistency upon standing, this being most marked in presence of ZnO. The TiO_2 pigments tended to settle in the resin vehicle. No retardation of drying upon ageing was observed. C. O. C.

Mechanical Properties of Cellulose Lacquers. VII—Influences of Pigments and Plasticisers on the Hardness. K. Ueki. *J. Chem. Soc. Japan, Ind. Chem. Sect.*, 55, 29–30 (1952); *Chem. Abs.*, 47, 9629 (25 Sept. 1953).

A study of the influences of ZnO, metallic Al and tricresylphosphate upon the hardness of cellulose nitrate, benzyl cellulose, polyvinylacetate and dammar. With ZnO and Al hardness increases linearly with the amount present. With tricresylphosphate hardness increases nearly linearly with the amount present as long as the amount is small. C. O. C.

Coloured Silicone Finishes. M. A. Glaser and E. Miller. *Product Eng.*, 24, (3), 167–174 (1953); *Chem. Abs.*, 47, 9029 (10 Sept. 1953).

Silicone finishes containing Al pigments withstood corrosive atmospheres and temperatures of > 1000°F. while maintaining good film integrity and appearance. Addition of black resin pigments either enhanced or did not lower the heat and chemical resistance of the silicone vehicle. Silicone pigmented with other colours is not as heat resistant but fills an important place between conventional finishes and inorganic materials. Formulation of silicone vehicles and their pigments for specific uses are discussed with tables and coloured illustrations. C. O. C.

Radiochemistry in Paint Research. D. F. Rushman. *J. Oil & Col. Chem. Assoc.*, 36, 352–372 (July 1953).

The laws of radioactivity, the use of radio-active isotopes as tracers, and the techniques and necessary precautions associated with this work are described (throughout 12 of the 21 pages comprising the paper). The high sensitivity of isotope labelling methods has been utilised in the study of conditions obtaining at paint-substrate interfaces, using P^{32} in the form of H_2PO_4 , either by labelling a constituent of the paint, or by conferring surface radioactivity upon the substrate and examining the subsequently stripped paint film for activity. The analogous behaviour of chromate pigments in paint films on a chromium surface may be studied by this method. The leaching out of a labelled component (or its degradation products) may be followed during weathering of a panel; sulphur compounds may be identified as originating from the sulphide or the sulphate component of lithopone. Analytical applications of radiochemical methods include—(a) estimation of naturally occurring radioactive material such as Th in rutile; (b) estimation of K in pigments by the slight activity of the K^{40} isotope which is always present to the extent of 0.12% of normal K; (c) the method of "isotope dilution" in which separations which cannot be obtained quantitatively (e.g. separation of fatty acids or triglycerides) are followed quantitatively by adding a known weight of a labelled sample of the component to be isolated, and comparing the recovered activity with that originally added before separation; and (d) the micro-analysis of fatty acid mixtures by separation on paper

chromatograms followed by conversion to the Co^{60} salts which may be located and estimated by their activity. The separate fractions may then be reacted with labelled Wij's iodine soln., and their Iodine Values obtained by measurement of the I^{131} activity. The nature of pigment surfaces has been studied, e.g. by shaking BaSO_4 with a soln. containing radioactive Ba^{2+} until equilibrium was attained in the rapid interchange between Ba^{2+} in soln. and on the pigment surface. By measuring the ratio of activity of soln. to that on the pigment surface, the number of Ba^{2+} originally on the pigment surface may be found. Similarly, the SO_4^{2-} on the surface may be found using radioactive SO_4^{2-} in soln. The rate of pigment sedimentation in viscous systems may be studied without disturbance for sampling purposes, either by the use of a directional counter coupled with a recording milliammeter to record the activity at any desired level, or by recording the arrival of radioactivity at the bottom of the system by the use of an isotope with radiation of low penetrating power. There are diagrams showing these two arrangements. The use of radioactive isotopes as tracers in chemical reactions is typified by a study, discussed at length, of the dehydration of castor oil using labelled H_3PO_4 as catalyst. The identification of end groups in long chain polymers has also been carried out by isotope labelling. The method has been used also to examine the kinetics and mechanisms of ester interchange in oil and varnish systems, and an example is described in which C^{14} is used to label the methyl group of methyl stearate and thus to follow the interchange occurring with methyl oleate when mixtures of the two esters are heated. The usefulness of radioactive isotopes in the thickness gauging of surface films is limited by the wide range of scattering powers exhibited by the pigments commonly used, this rendering the universal calibration of any such gauge impossible. There are 8 references to the literature, 7 photographs of radiochemical operations, and a full report of the discussion which followed the presentation of the paper.

J. W. D.

PATENT

Paints and Coloured Plastics. PORTANS. *BP* 698,329
Powdered pigment is dispersed in a liquid carrier of low viscosity and the dispersion then mixed with a more viscous liquid to form a paint or to the preparation which is to produce the required plastic. C. O. C.

Lac Dye and its Lakes (IV p. 509).

Development and Use of Pearl Essence Substitute (IV p. 509).

VI—FIBRES; YARNS; FABRICS

Books about Textiles. *Dyer*, 190, 911-913 (26 June 1953).

Additions to the classified list of books on textiles and related subjects printed in *Dyer* of 13th June 1952. Includes books on fibres, spinning, weaving and knitting, fabrics, dyeing, printing, finishing, washing and cleaning, dyes and intermediates, textile chemistry, oils, fats and surface-active agents, polymer chemistry and plastics, Economics, statistics and management, surveys, dictionaries and annuals. W. R. M.

Static Electricity in Textile Fibres. K. Götze, W. Bräsele, and F. Hilgers. *Melliand Textilber.*, 34, 141-142 (Feb.); 220-222 (March); 349-350 (April); 451-452 (May); 548-550 (June); 658 (July); 768-769 (Aug. 1953).

A review with 54 references, together with new experimental results. The following methods of avoiding difficulties due to static electricity are listed and discussed—A. Physical: (a) earthing of machines; (b) supplying the opposite charge; (c) allowing friction only between similar materials; (d) ionisation of air (through ultraviolet light, glow-discharge, point-discharge, rod-ionisators, and radio-active rays); (e) raising R.H. B. Sizing the fibres. C. Preparing the fibres through: (a) thick oil films; (b) smoothing preparations; (c) antistatic agents. Results now obtained for a selection of fibres show that the charge developed depends on the speed of take-off, increasing with increased speed, except for acetate rayon (I). Differences between various fibres become less at greater speeds. The unpredictable behaviour of I is attributed to piezoelectric effects. The charge developed at various speeds of take-off

decreases as R.H. increases, except for I. A connection between the charge developed and the specific resistance of various fibres is demonstrated. Specific resistance appears to be an important factor at low speeds of take-off, at high speeds there is no time for charge-equalisation. Comparatively small differences in conductivity of a particular material have much greater effects on the charge developed than a comparison of conductivities of different fibres would suggest. Tables summarise the charge developed at 180 m. and 400 m. take-off and the specific resistance, at 50% and 65% R.H. on viscose rayon, I, and Perlon, both untreated and containing 0.3% of various classes of reagents. In discussing the results it is pointed out that only those reagents which give rise to a high ionic concn. in very small amounts of water will improve the conductivity of fibres. The size of the micelles formed by the reagent is of importance in preventing the disadvantageous penetration of the fibre by the reagent. Such considerations lead to sulphonated products which are stated to be satisfactory in worsted yarn spinning, in sizing, knitting, stocking-manufacture, and Perlon-production. H. E. N.

Recent Physicochemical Investigations of the Cotton

Fibre. Kh. U. Usmanov. *Izvestiya Akad. Nauk S.S.S.R. Otdel. khim. nauk*, 459-469 (May-June 1953).

In a discussion of physical and chemical properties to be taken into account in the selection of new strains of cotton, graphical data are presented relating to the effect of the variety and maturity of cotton on its chemical composition (content of cellulose, wax, pectins, pentosans, etc.), degree of polymerisation, tensile behaviour, and sorptive properties. A. E. S.

"Weak Bonds" in Cotton Cellulose. A. Sharples. *Chem. and Ind.*, 870-871 (15 Aug. 1953).

It has been suggested that chain molecules of natural celluloses may contain a small fraction of extremely acid-sensitive linkages spaced regularly along the chains. A decrease in the apparent rate constant observed during heterogeneous hydrolysis of cellulosic samples may be attributable either to the presence of linkages with different rate constants or to the effects of crystalline structure. Non-degradative regeneration of cotton from dilute solutions in alkali reduces the crystallinity of Egyptian cotton sufficiently for the kinetics of hydrolysis to be followed under virtually homogeneous conditions. When the alkali treatment is carried out in the absence of O_2 the rate constant is found to remain unchanged over the relevant range of m.wt. and its absolute value agrees with that expected for normal glycosidic bonds. If precautions are not taken to prevent oxidation a limited number (ca. 1 in 670) of extremely acid sensitive linkages is formed. The rate constant of these bonds is about 10,000 times greater than that of the normal bonds. While there are no "weak bonds" of the type previously suggested present in cotton cellulose there is a small fraction of extra-normal linkages which can be made acid sensitive by alkaline oxidation. W. R. M.

Internal Surface of Cellulose. H. Grotjahn and K. Hess. *Kolloid-Z.*, 129, 128-132 (Dec. 1952).

From the adsorption of argon at the temperature of liquid oxygen, the total surface areas of various forms of cellulose have been calculated using the Brunauer, Emmett, and Teller isotherm. Cotton fibres dried *in vacuo* at 100°C. or having a regain of ~6% possess an internal surface of 1.3-1.8 sq.m./g.; rayon fibres have even lower values (0.3-0.6). If, however, the water is removed from the swollen fibre by pyridine or alcohol the area is found to be larger (3.6-6.2); ether followed by alcohol can increase the value to 9.5, but butanol yields values up to 37.7 sq.m./g. Grinding the fibres in a mill enables alcohol to increase the area up to ~100; removing the water by butanol leads to values as high as ~200. Cellulose precipitated as a finely divided powder and dehydrated by butanol has an area of ~300 sq.m./g. Microfibrils of diameter ~200 Å. would have an area of 132 sq.m./g. and the above values are, therefore, reasonable. L. P.

Surface Areas of Cottons and Modified Cottons before and after Swelling as determined by Nitrogen Sorption. F. H. Forziati, R. M. Brownell, and C. M. Hunt. *Bur. Stand. J. Res.*, 50, 139-145 (March 1953).

Surface areas of cottons differing in variety and maturity

and cottons that had been subjected to various treatments had been measured before and after swelling. Swollen cottons were prepared by immersing air dried cottons in water at room temperature for 24 hours, displacing the water with methanol and the methanol with pentane, finally drying the fibres. Surface areas have been calculated from the quantity of N_2 adsorbed at -195.8°C . Specific surfaces of unswollen cottons were $< 1 \text{ sq.m./g.}$ Those of swollen fibres varied from 4 to 148 sq.m./g. Purification and mercerisation produced an increase in surface available after swelling. Methylenation produced a decrease. Ethylamine treatment had no effect. In the early stages of methanolysis a decrease in surface available after swelling occurred; in the later stages an increase was observed.

W. R. M.

Reactivity of Cellulose. II—Water Sorption, Heats of Wetting, and Reactions with Thallous Ethoxide in Ether, Nitration Mixtures, and Heavy Water of Cotton Linters alternatively Wetted with Water and dried. W. J. Brinkman, H. B. Dunford, E. M. Tory, J. L. Morrison, and R. K. Brown. *Canadian J. Chem.*, **31**, 559–563 (June 1953).

Cotton linters dewaxed with benzene and alcohol possess a slightly expanded structure attributed to swelling by the alcohol. Storage causes a partial collapse of the linters particularly if moisture is present. Wetting followed by rigorous drying causes a marked reduction in accessibility but with each additional wetting-drying cycle accessibility of the dried linters, as measured by reaction with thallous ethylate in ether, nitration and hydrogen-deuterium exchange, increases slightly. Increased accessibility due to repeated wetting and drying is accompanied by lower water absorption and smaller heats of wetting. This anomaly is due to the fact that cellulose samples obtained by alternately wetting and drying dewaxed linters, when stored with a desiccant, compete for the limited amount of water present and absorb water in proportion to their accessibility. Upon further exposure to water the sample of least accessibility can now absorb to a greater extent than samples of somewhat greater accessibility. Differences in accessibility due to repeated drying and wetting appear to be due to physical rather than chemical changes.

W. R. M.

Sorption of Water by and the Structure of Some Cellulosic Materials. K. U. Usmanov and V. A. Kargin. *Khim. i Fiz. Khim. Vysokomolekul. Soedinenii, Doklady 7-oi Konf. Vysokomolekul. Soedineniyam*, **1952**, 169–181; *Chem. Abs.*, **47**, 9609 (25 Sept. 1953).

The sorption isotherms for cellulose hydrated before and after heating for 2 and 10 hr. at 240°C . in glycerol are practically the same and independent of macromolecular structure. Treating cellulose at high temp. with liquid swelling agents decreases the sorption of water, and a series of celluloses differing in sorptivity can be obtained. Results are given of study of the deformation characteristics of bone- and air-dry cellulose. Values for the differential heat of wetting of cotton and viscose rayon for water-absorption range from 0–19%. The changes in free energy, heat content and entropy by sorption of water by cotton and viscose rayon are given. A detailed cross section of the vacuum dynamometer used is given.

C. O. C.

Fine Structure and Reactions of Native Cellulose. G. B. Rånby. *Ph.D. Thesis* (Uppsala 1952). 18 pp.

A summary and discussion of some publications of the author. The work commences with electron-microscopic examination of the fine structure of celluloses of different origin—wood, cotton and bacterial cellulose as well as those from algae and tunicates. In all cases the morphological structural elements are micellar fibrils 100 Å. wide of indefinite length containing about 240 cellulose chains. These fibrils are characteristic of α -cellulose, while β - and γ -cellulose consist of fragments of such fibrils, non-crystalline and without morphological structure.

The micellar fibrils are related to the so-called crystalline region but are not identical with it. The fact that by chemical methods a significantly lower easily accessible (i.e. amorphous) fraction is found (~ 5 –10%) than by X-ray measurement ($\sim 30\%$) is caused by the cellulose chains lying in the surface of the micellar fibrils ($\sim 20\%$ in a layer 5 Å. deep) which give rise to diffuse scattering of

X-rays and lower the intensity of the reflections. (Abstractor's ?)

The chemical properties of these fibrils were examined by mercerisation and acid hydrolysis. In mercerisation the phase transition Cellulose I \rightarrow Cellulose II was followed by X-rays, by electron-microscopy and by thermodynamic analysis of water absorption. Acid hydrolysis degraded the fibrils into pieces of different lengths having a mean weight corresponding a definite degree of polymerisation.

Special interest was devoted to the preparation of cellulose sols, obtained by peptising the hydrolysates. The sols are hydrophobic, coagulate on adding electrolyte but are stabilised by dissolved hydrophilic γ -cellulose. The work is completed by derivation of some molecular-weight distribution curves which demonstrate that wood cellulose is more strongly polydisperse than is cotton cellulose.

L. P.

Ethyleneimine-treated Cotton. G. L. Drake, W. A. Reeves, and J. D. Guthrie. *Text. Research J.*, **23**, 639–641 (Sept. 1953).

Raw cotton fibre has been treated with ethyleneimine vapour, and the fibre then converted into fabric. The treated cotton appears to have no advantage over untreated, except an increased uptake of acid dyes. A. B.

Mechanical Properties of Cotton Fibres. III—Effect of Alkali-metal Hydroxide on Fibres under Tension. E. L. Nimer, J. A. Lasater, and H. Eyring. *Text. Research J.*, **23**, 629–639 (Sept. 1953).

The effect of treatment in sodium potassium, and lithium hydroxide solutions on stress-relaxation curves and stress-elongation curves was measured. The interpretation of these curves is detailed.

A. B.

Heterogeneous Cellulose Decomposition. III—Mild Oxidative Decomposition of Cotton by Sodium Toluenesulphonchloramide. T. Kleinert and V. Mössner. *Sitzungsber. Öster. Akad. Wiss.*, **162**, (5–6), 641–644 (1953).

The form of the decomposition curve for cotton by means of sodium toluenesulphonchloramide solutions is similar to that for artificial cellulose, but the rate of decomposition for cotton is essentially lower. About four atoms of oxygen are used up in the mild oxidative cleavage.

H. H. H.

Sporulating Anaerobes on English Flax. E. Hellinger. *Nature*, **171**, 1119 (20 June 1953).

Hard Fibres in the World Economy. W. Bally. *Ciba Review*, **9** (99), 3542–3, 3574 (Aug. 1953); **Agaves**. *Ibid.*, 3545–3553, 3574; **Abaca**. *Ibid.*, 3555–9, 3574; **New Zealand Flax**. *Ibid.*, 3561–3, 3574; **Bromeliaceae (Pineapple) Fibres**. F. Tobler. *Ibid.*, 3565–7, 3574; **Extraction of Leaf Fibres**. *Ibid.*, 3569–3573.

A brief survey of the amounts of hard fibres produced both before the 1939–45 war is followed by illustrated accounts of the history and growth of the vacuum species of agave, of which sisal is much the most important, of abaca fibre from *Musa textilis* a type of banana plant cultivated in the Philippine Islands, of New Zealand flax and various species of pineapples which are now being largely cultivated in Brazil and Argentina for use especially for twine and canvas. The extraction of all these fibres from the leaves is described. A bibliography, 42 references, covers all aspects of the production, properties and uses of the hard fibres.

C. O. C.

Structure of Wool. F. Happey, T. P. MacRae, and G. J. Weston. *Nature*, **172**, 673–674 (10 Oct. 1953).

Infrared examinations of keratin fractions, obtained by peracetic acid-ammonia treatment, in the region of the strong carboxyl stretching frequency at 1600 – 1700 cm^{-1} show that in the film made from soluble keratin there is only evidence of an α C=O stretching frequency; the X-ray diagram of the same film gives an α -keratin configuration, and when filaments are made by extrusion an oriented α -diagram comparable with natural wool is obtained. For films of the insoluble residue, made at 20°C ., the infrared spectrum shows a peak characteristic of the α -form, with a definite shoulder characteristic of the β -form. There is no change in the relative intensity of this β -shoulder if the film is heated to 30°C . in water and dried. X-ray diagrams, however, are widely different. At 20°C . the characteristic α -diagram is absent, but the 4-5 Å. β -reflexion is diffuse. In the 30°C . extraction film the β -line becomes more defined, and in a film heated in water 10 min.

at 30°C. and dried the diffraction diagram shows a strong ring at 4.65 Å. In an experiment in which the slurry is extruded through a fine jet a pseudo-filament is formed with little or no orientation but a strong reflexion at 4.65 Å. It is suggested that stressing the insoluble particles leads to a crystallisation of the β -phase, which may also occur during centrifuging. It would appear, therefore, that the presence of the β -phase in the insoluble fraction of wool is a true phenomenon measured by the infra-red method, and that its relative proportions under the conditions cited are constant in any one sample. Its unambiguous identification from an X-ray diagram may however depend on the degree of crystallinity, which can be modified by manipulation or, in certain cases, by the orientation of particles in the insoluble material. J. W. B.

Leucine-isoLeucine Content of Wool. D. H. Simmonds. *Nature*, **172**, 677-678 (10 Oct. 1953).

In a total amino-acid analysis of 648 merino wool, using the Moore and Stein chromatographic method, the proportions of leucine and isoleucine are completely separated and estimated. Although their ratio differs considerably from those previously reported, the total amount is close to that recorded by Martin and Syngé (*Biochem. J.*, **35**, 91, 1358 (1941)) but not to that by Gordon, Martin, and Syngé (*ibid.*, **37**, 79 (1943)). J. W. B.

Birefringence and Elasticity in Keratin Fibres. R. D. B. Fraser. *Nature*, **172**, 675-676 (10 Oct. 1953).

Human hairs are extended in water on the stage of a polarizing microscope, using a microextensometer. The extension ratio is measured by observing the separation of particles of carbon deposited on the hair scales, and is graphed against the corresponding determination of birefringence. Comparative load/extension curves are shown. It is found that the initial birefringence differs from fibre to fibre but the fractional increase at any extension shows little variation. Approximate birefringence values for α -helix and pleated sheet configurations (Pauling and Corey) are calculated assuming a perfectly oriented fibre; comparison with the experimental values indicates that a significant fraction of the keratin is poorly oriented. Changes in slope of the birefringence/extension curves are interpreted, and discussed, in terms of a transition from one idealised behaviour to another. At 50% extension a 150% increase in birefringence is found, which is very much greater than earlier results obtained on horsehair. The discrepancy may be due to a rapid relaxation of birefringence at high extensions. J. W. B.

Resistant Components of the Cortex of Animal Hair. E. H. Merceer. *Nature*, **172**, 164-165 (25 July 1953).

In order to ascertain the exact disposition of a subcuticular membrane, cross-sections of hair oxidised with peracetic acid are treated with ammonia. They thereupon swell to three times their original diameter, and the corticle residue is seen to extend as a network throughout the cortex and to consist of the cell membranes which originally bounded the cortical cells. No distinct subcuticular membrane is seen. In addition to the cell membranes, various other particulate forms resist solution; some are in nuclear cavities and others distributed throughout the cells, the distribution in wool being asymmetrical. They are found predominately in one half of each fibre cross section, and it is suggestive that this distribution may be related to phenomenon such as twisting and curling, which also point to structural asymmetry. J. W. B.

Supercontraction of Modified Keratin Fibres. L. G. Beauregard, A. E. Brown, and M. Harris. *Text. Research J.*, **23**, 642-643 (Sept. 1953).

Modified keratin fibres were prepared in which the labile disulphide bonds were replaced by thioether linkages, so that they could no longer participate in supercontraction reactions. The supercontraction behaviour of the fibres is a reducing agent and is a hydrogen-bond-breaking agent. In the treated fibre the supercontraction is completely inhibited in the reducing solution, but in lithium bromide supercontraction occurs to approximately the same extent in both untreated and treated fibres. A. B.

β -Forms of Fibrous Proteins and Synthetic Polypeptides. C. H. Bamford, L. Brown, A. Elliott, W. E. Hanby, and I. F. Trotter. *Nature*, **171**, 1149-1151 (27 June 1953).

X-Ray reflexions from the shorter spacings in some synthetic polypeptides and fibrous proteins are examined

with a view to determining the axial repeat distance, particularly for the extended polypeptide configuration. Among the interesting results discussed are the failure to find 1.1 Å. and 1.5 Å. reflexions in swan quill under conditions which show them in other polypeptides and proteins; an explanation is advanced which furnishes evidence for planar amide groups in feather keratin, wherein rotation of single bonds only has the effect of destroying the approximately equal succession along the chain axis of atoms in the backbone, thus resulting in failure to detect certain reflexions. Fibre repeat-distances in the β -forms of synthetic polypeptides and in silks are tabulated and are surprisingly similar considering the wide variations in the size of the side chains. Such variations as found may be attributed to the presence or absence of a β -carbon atom rather than to the total bulk of the side chains. As the C-axis repeats of the β -keratins are so much smaller it is concluded that in this respect the character of the side chains is more important than their size. J. W. B.

Ability of Colloid Solutions to form Fibres. H. Thiele and H. Lamp. *Kolloid-Z.*, **129**, 25-39 (Nov. 1952).

An apparatus is described for measuring the ability of colloid solutions to form fibres (*Spinnbarkeit*). It enables the maximum length of liquid thread to be measured under known conditions. The reproducibility corresponds to a maximum error of 3.5%. Maximum thread lengths are obtained with medium speeds of stretching and from sols of moderate viscosity and elasticity. The thread length increases linearly with the quantity adhering to the dipstick. This quantity depends on the radius of the dipstick and the depth to which it is dipped before it is extracted from the solution. For each substance the amount involved is determined by the viscosity, surface tension, and adhesion of the sol. The threads have a diameter of 280-380 μ . at 1/64 sec. before rupture.

The following preconditions must be fulfilled for a sol. to be spinnable—(1) the colloid solution must be of elongated lyophilic particles; (2) the thread micelles must have sufficient mobility of free rotation; (3) a thixotropic gel structure opposes the ability to be spun; if destroyed by agitation the ability to form threads increases; (4) elasticity only acts favourably to a definite degree; frequently it acts like thixotropy in the opposite direction.

An attempt is made to relate this spinning ability to the nature of the bonds or forces between the thread-like micelles.

Measurements on soap sols. show that besides pH 9.5, the inversion point for the transition of the flat plate-like soap micelles to the thread-like form, there is a further characteristic point at pH 10. Here, hydration, transparency, viscosity, frothing, and spinnability are at a maximum. The cause is the extent of dissociation of the COOH groups and the charge or ζ -potential of the micelle. L. P.

Two Structural Modifications of Solid Synthetic Polyamides. N. V. Mikhaylov and V. O. Klesman. *Doklady Akad. Nauk S.S.S.R.*, **91**, 99-102 (1 July 1953).

Polycaprolactam is obtained in two solid forms—an amorphous glass-like form prepared by rapid cooling of the melt, and a crystalline form prepared by slow cooling of the melt or by slow evaporation of solvent from a soln. X-Radiographs are presented that illustrate the great difference in crystallinity between the two forms. The thermal effects occurring when specimens are heated are observed. The amorphous form shows an endothermic effect at 120-150°C. (devitrification) and a further effect (melting) at a temp. (216-222°C.) that is independent of the rate of heating. The crystalline form shows only one endothermic effect (melting), at 206-216°C. when the temp. rises at 3-5° per min., and at 218-233°C. when the rate is 20-25° per min. Polycaprolactam fibre gives an effect, attributed to crystallisation, at $\sim 25^\circ$ C. below the m.pt. Estimates are made of the magnitudes of the various heat changes. A. E. S.

Infrared Dichroism in Synthetic Polypeptides. A. Elliott. *Nature*, **172**, 359-360 (22 Aug. 1953).

A thin nylon specimen in which there is no complication from double orientation is obtained by grinding a thick oriented monofil of circular cross-section, and its spectrum observed with polarised radiation from a selenium transmission polariser of high performance. Dichroic ratios of

3.1 and 4.1 are obtained respectively for the 1,640 cm^{-1} C=O band and the 3,310 cm^{-1} band, thus showing that the transition moments of these bands are not parallel. Qualitatively, the lower dichroism of the C=O band, compared with the NH band, is in agreement with suggestions of Fraser and Price (*Nature*, **170**, 490 (1952)) and with the observations on acetanilide, but the effect is smaller than that expected. Discussion of the results raises the question as to whether the amide groups in nylon, in simple molecules and in folded polypeptides, can retain substantially the same parameters, a question which cannot be answered without further experimental evidence.

J. W. B.

Structure and Behaviour of Linear High Polymers as Exemplified by Polyethylene Terephthalate.

W. Griehl. *Faserforsch. und Textiltech.*, **4**, 380-387 (Sept. 1953).

Double Refraction of Polyvinyl Alcohol Fibre.

S. Okajima, Y. Kobayashi, and R. Yamada. *Bull. Chem. Soc. Japan*, **26**, 235-238 (July 1953).

The intrinsic double refraction of model filaments of polyvinyl alcohol have been determined after stretching and heat treatment under various conditions of relative humidity. The increase of double refraction with degree of stretch becomes more marked as stretching is carried out at lower R.H. and higher temperatures. This difference tends to decrease when the filaments are heated at 140°C. for 15-30 min. and the double refraction tends to a limiting value as the degree of stretch is increased. W. R. M.

Further Evidence against the Orientation of Structure in Glass Fibres.

R. T. Brannan. *J. Amer. Ceram. Soc.*, **36**, 230-1 (1953); *Chem. Abs.*, **47**, 8979 (10 Sept. 1953).

The elastic properties lend no support to the view that strong bands are preferentially oriented in glass fibres.

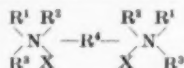
C. O. C.

PATENTS

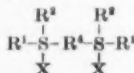
Insolubilisation of Polycarbonamides containing Tertiary Nitrogen in the Chains.

DuP.

Polymeric materials containing tertiary nitrogen or divalent sulphur groups can be cross linked by treatment with a polyfunctional compound through formation of onium salt bonds. For polymers containing tertiary nitrogen the onium salt formed is of formula



(R^1 = part of the principal polymeric chain; R^2 and R^3 = same or different part of the principal polymeric chain or any organic radical; R^3 = a radical between two functional groups in the cross-linking agent; X = the functional group of the cross-linking agent. For polymers containing a divalent sulphur group the onium salt is of formula



The products have higher sticking temperature, higher zero strength, lower creep and elongation, solvent resistance, etc., and are useful for making fibres, films and coating compositions. C. O. C.

Solutions of Acrylonitrile Polymers.

American Viscose Corpn. BP 697,848

A mixture of nitromethane, acetonitrile and water (0.5-10% by vol. of the total mixture) readily dissolves polymers containing acrylonitrile at 50-70°C. The solutions are clear, free from objectionable colour and useful for producing fibres. C. O. C.

Polyacrylonitrile Spinning Solutions.

Vereinigte Glanzstoff-Fabriken. BP 698,714

Gelatinisation of polyacrylonitrile solutions is prevented by keeping the total water content to below 1.5% preferably 0.2%.

C. O. C.

Solutions of Polyacrylonitrile.

Chemstrand Corpn. BP 698,524

Solutions of low viscosity are obtained by dissolving fibre-forming acrylonitrile polymers in a solvent containing

0.1-5.0% (on the wt. of solvent) of dimethylamine hydrochloride, hydroxylamine hydrochloride, phenyldiazine hydrochloride or aniline sulphate. C. O. C.

Copolymers of Acrylonitrile and N-Acryl-N'-alaryl-methylenediamine.

Sun Chemical Corpn.

USP 2,627,512

Copolymers of acrylonitrile and compounds of formula $\text{CH}_2=\text{CR}-\text{CO}-\text{NH}-\text{CH}_2-\text{NH}-\text{CO}-\text{CHR}-\text{CH}_2-\text{Y}$ ($R = \text{H}$ or CH_3 ; $Y =$ residue of an aliphatic amine, alicyclic amine or heterocyclic amine, having at least one H atom attached to the amino N atom which is in turn linked to the resin chain of the above compound) are readily formed into fibres and films and have high affinity for acid dyes. C. O. C.

Mass Dyeing of Viscose Rayon (VIII p. 515).

Demonstration of Keratin with Aldehyde-Fuchsin (XIV p. 521).

VII—DESIZING; SCOURING; CARBONISING; BLEACHING

Nomenclature in Starch and Pectin Zymology.

E. Schubert. *Mellian Textilber.*, **34**, 322-323 (April 1953).

Rôle of the Substrate in the Detergency Process.

M. N. Fineman and P. J. Kline. *J. Colloid Sci.*, **8**, 288-299 (1953); *Chem. Abs.*, **47**, 9638 (25 Sept 1953)

The particle size of a synthetic soil (carbon black (1 part) aliphatic mineral oil (2)) removed by detergent depends on the nature of the soiled surface. Experiments in a laundrometer using 0.1-1.0% of a nonionic alkylaryl-polyether alcohol detergent showed that metal surfaces release finely dispersed soil particles that are rapidly removed during washing, whereas large particles are removed slowly from non-metallic surfaces, under the same laundering conditions. Charged metals showed rapid soil removal from the cathode and none from the anode. Below the isoelectric part, nylon was cleansed more readily than the above. These conditions are unique for carbon soils and nonionic detergents. Anionic detergents remove carbon soil from glass but not from metals. Cationic detergents promote deposition of carbon soil on glass. Soils containing sulphur instead of carbon are not dispersed under the above conditions. Soils containing TiO_2 instead of carbon are readily dispersed, even by water without detergent. The observed phenomena evidently depend on the polarisability of the carbon particles. C. O. C.

Wool Carbonising and Associated Processes.

E. J. Wilkinson. *J. Bradford Textile Soc.*, 101-107 (1952-53).

An account of modern practice in the carbonising of raw wool. C. O. C.

Equilibria in Bleach Liquor. II—The Oxidation Potential of Aqueous Solutions of Hypochlorous Acid.

L. T. Muus, I. Refn, and R. W. Asmussen. *Trans. Danish Acad. Tech. Sci.*, (2), 3-23 (1951); *Chem. Abs.*, **47**, 9621 (25 Sept. 1953).

A study of the effect of pH on the potential of an inert electrode (platinised Pt) in hypochlorite soln. Curves of the potential of the Pt electrode is that of the glass electrode (both measured against the sat. calomel electrode) were straight lines. They were similar irrespective as to whether Na_2SO_4 , LiSO_4 , NaCl , KCl or LiCl , in varying conc., were used as the supporting electrolyte. From the inclination of the curves and because the Cl ion has no significant effect on the potentials, it is thought that the potential-determining step is $\text{Cl}_2 + 4\text{H}_2\text{O} = 2\text{HClO} + 2\text{H}_3\text{O}^+ + 2\text{e}^-$ in acid soln. and $\text{Cl}_2 + 6\text{H}_2\text{O} = 2\text{ClO}^- + 4\text{H}_3\text{O}^+ + 2\text{e}^-$ in alkaline soln. The potential-determining amount of Cl is greater than the equilibrium concentration in the body of the solution and is assumed to be adsorbed on the Pt electrode. Measurements were neither reproducible nor satisfactory if bright Pt or An electrodes were used instead of platinised Pt. The dissociation constant for HOCl at 25°C. was found to be $3.2 \pm 0.4 \times 10^{-8}$. The authors' data are correlated with those of other workers. C. O. C.

VIII—DYEING

Dyes and Dyeings in Nigeria. Anon. *Nigeria Trade J.* 1, (3), 7-9 (July 1953).

Natural indigo, derived from various plants, is still largely used in Nigeria and there is an illustration showing the dyeing of indigo in pits. Each of these pits requires 12-13 donkey loads of leaves and ashes to set it, but as it is now usual each time a pit is used to bring it up to strength by adding synthetic indigo, the dyeing is really done with synthetic indigo and the indigoferous leaves are really used as a ferment. Other natural dyes still in use are turmeric (mainly for yellows on straw and leather), guinea corn stalks (for blacks and reds on mat fibres and leather), acacia pods (for blacks on leather with an iron mordant), a black also being obtained in one district by the use of the African pear tree. At the textile training centres of the Department of Commerce and Industries dyers are now being taught to use the hydrosulphite vat. Success is also attending the introduction of direct cotton and, surprisingly, vat dyes probably because most Nigerian dyers are accustomed to using indigo. The difficulties attending the introduction of new methods of dyeing are indicated; for instance most synthetic dyes require the use of heat whereas indigo can be dyed at ordinary atmospheric temperature. Steam is available only in a few factories and so improvised methods have had to be developed. For instance it was found that forty-four gallon petrol drums, opened longitudinally and built over a fireplace, make useful dyebecks capable of holding up to 24 lb. of cotton yarn. Experiments have shown that yarn and cloth can be dyed in these becks at a price which meets local requirements. C. O. C.

Salt Formation and Stability to Air of Naphthols.

R. Löwenfeld. *Melliand Textilber.*, 34, 324-327 (April 1952).

From the behaviour of Naphtholates on potentiometric titration and from the effect of formaldehyde (I) on their stability, they can be divided into three classes—1. Monobasic and unstable alone, but dibasic and stable in presence of I, e.g. AS, AS-RL, AS-VL, AS-E, AS-TR, AS-LT, AS-RL and AS-VL are dibasic only after reacting with I for 30 min. at 40°C., and after a shorter treatment would remain unstable. 2. Dibasic and stable with or without I, e.g. AS-OL, AS-BI, AS-ITR, AS-BG, AS-BO, AS-BB. I improves the stability only a little, but is still used. AS-PH also belongs to this group but falls between groups 1 and 2 in stability without I. 3. Monobasic with or without I, e.g. AS-LB, AS-BT, AS-SG. Stability is unaffected by I. On titration in methanol without I all Naphthols are dibasic. This is thought to explain the function of alcohols in the cold dissolving method. Lactam-lactim tautomerism in Naphthols and the mechanism of the action of I are discussed. H. E. N.

Progress in Dyeing Wool and Rayon Staple Slubbing. A. K. Günther. *Melliand Textilber.*, 34, 328-330 (April 1953).

The standard machines are described, also a new process by G. Nitschke (*Textil- und Faserstofftechnik*, pp. 34-37 and 69-71 (1952)). This uses special units, in which rayon staple slubbing has been dyed continuously with sulphur black, giving a time of dyeing of 15-20 sec. at 90°C. The machine consists essentially of two pairs of squeeze rollers immersed in the bath and a mangle, together with pump and reservoir. H. E. N.

Relation between Dye Uptake and Cytoplasmic Streaming in *Amaba proteus*. D. M. Prescott. *Nature*, 172, 593 (26 Sept. 1953).**Physicochemical Studies of Organic Dyes in relation to Photochemistry. I—Effect of Light on the Adsorption Equilibrium.** M. Koizumi and M. Imamura. *Bull. Chem. Soc. Japan*, 26, 111-114 (April 1953).

The equilibrium adsorption of Rhodamine 6G from solution by silica gel is reduced by exposure to light. The effect increases with intensity of illumination. It is suggested that the excess energy which the dye molecule gains by absorption of a photon is dissipated as thermal energy, unless photochemical change or luminescence occurs. If the dissipation occurs selectively toward the adsorbent rather than the solvent, the temperature of the adsorbent may rise locally, causing a decrease in adsorption. W. R. M.

PATENTS

Dyeing Wool-cellulose Acetate Mixtures. Celanese Corp. of America. *USP* 2,626,202

Any stain on the wool caused by the cellulose acetate dye, or at least that portion of the stain which has poor light fastness, can be removed by treating with a 0.5-4.0% aq. soln. of a titanous salt at 25-60°C. for 10-60 min. before the wool is dyed. C. O. C.

Dyeing Mixtures of Carbonised Wool and Cellulosic Fibres. Courtaulds. *BP* 698,192

Presence of hexamethylene tetramine in the bath when dyeing the cellulosic component with a direct cotton dye prevents the cotton dye going onto the wool when dyeing by either the single or the two bath method. About 5% hexamethylene tetramine on the weight of the material gives good results. C. O. C.

Dyeing Terylene. I.C.I. *BP* 697,983

The affinity of Terylene for disperse dyes is increased by treating it with saturated aqueous zinc chloride, e.g. at 110-120°C. for 5 sec.

BP 697,985
Saturated aqueous lithium bromide is used, e.g. at 110-160°C. for 15 sec.

BP 697,984
If a mixture of zinc chloride and lithium bromide is used then the solution need not be saturated, the addition of as little as 3 parts by weight lithium chloride to 100 parts of zinc chloride considerably increasing the effect of the latter and enables the temperature and the time of treatment to be reduced.

BP 697,986
Treatment with sulphuryl chloride is used. C. O. C.

Improving the Dyeing Properties of Polyesters. Calico Printers' Assocn. *BP* 697,657

The affinity of polyesters, e.g. Terylene, for dyes is increased by alternate treatments with ammonia and hydrochloric and/or sulphuric and/or nitric acid it being immaterial which treatment is given first. C. O. C.

Modifying Polyester Fibres. I.C.I. *BP* 698,120

Treating polyester fibres, e.g. Terylene, or yarns or fabrics containing them, with aq. Na₂S imparts increased affinity for disperse dyes and a heterogeneously pitted surface which (1) assists bonding to rubber, (2) reduces the lustre without use of a dulling agent, (3) reduces the frictional grip between yarns and smooth surfaces, and (4) reduces the thickness of the fabric and so confers a softer handle. C. O. C.

Mass Dyeing of Viscose Rayon. N. V. Onderzoekings-instituut Research. *BP* 698,158

A purified free leuco compound of a vat dye is dissolved in the viscose spinning solution. C. O. C.

Pad Dyeing with Pigmented Resin Compositions. Sherwin-Williams Co. *USP* 2,627,507

An aqueous dispersion containing a pigment, a water-insoluble cellulose ether, a water-insoluble alkylated melamine-aldehyde resin, a non-volatile plasticiser and < 5% by weight of a water-soluble organic solvent padded, dried and cured, yields uniform dyeings of improved fastness. C. O. C.

Dyeing Polyester Fibres with Acid Leuco Vat Dyes. H. Luttringhaus, H. R. Mautner and A. A. Arcus. *USP* 2,627,449

Deep dyeings can be obtained on polyester fibres by impregnating them with an acid leuco vat dye and then heating at 300-400°C. for a little while. C. O. C.

Colouring of Paper Stock (XI p. 517).

IX—PRINTING

Art of Copperplate Engraving and Etching. M. Osborne. *J. Oil & Col. Chem. Assocn.*, 36, 335-336 (June 1953).

Report of a lecture in which the raw materials and methods of line-etching, drypoint, aquatint, and mezzotint are outlined with reference to the works of Dürer, Nicholson, Rembrandt, Van Dyck, Reynolds, and Turner. No method resulting from technical advances has superseded the methods of these masters. J. W. D.

PATENTS

Screen Printing. Jafrá Publicity.

BP 697,955

Before each colour, or each colour but the first, is applied the material is placed in printing position with the aid of a transparent positioning guide which brings the material and the screen into correct registration. C. O. C.

Printing on Rubber Balloons. A. L. Smith.

USP 2,627,486

The design is screen printed onto a paper backing which is then coated with a viscous rubber film and is firmly pressed against the balloon while the latter is inflated and the paper backing removed. C. O. C.

Colour Photography. I.C.I.

BP 698,046

When a yellow styryl dye of the type described in BP 673,091 is used as a coloured colour former and also to form the masking image, the intensity of the masking image and its absorption characteristics and permanence can be improved if the film, after colour development, is treated with a substance capable of decomposing the *p*-subst.-aminobenzylidene derivative of the aromatic amine used as the developer and liberating the *p*-subst. aminobenzaldehyde therefrom.

BP 698,047

Three differently sensitised gelatino-silver halide emulsions are used containing yellow, magenta and cyan colour formers. One of the outermost sensitive layers is sensitive to blue light only and is next to the middle sensitive layer which contains a yellow styryl dye. This yellow dye acts both as a yellow filter dye and as a magenta colour former; it is water-soluble and carries a substituent rendering the dye nondiffusible, e.g. a substituent containing an alkyl chain of > 4 C. It is obtained by condensing a reactive methylene compound with an anil of a water-soluble or alkali-soluble aldehyde of formula



(the benzene nucleus may be substituted; R^1 and R^2 = alkyl substituted by Hal, CN, COOAlk, NO_2 carboxyl or sulphonic acid, when only R^1 or R^2 is such a subst. Alk then the other = a subst. or unsubst. hydrocarbon radical). C. O. C.

Developing Multilayer Colour Films. Miralcol-R.

USP 2,626,215

A method of making direct colour prints without using intermediate negative or positive colour transparencies. C. O. C.

Light-sensitive Diazotype Material. Chemische

Fabriek L. van der Grinten.

BP 698,027

Light-sensitive layers containing a compound of formula

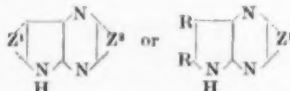


(X = anion; R^1 and R^2 = same or different Alk of 4–7 C, $R^1 + R^2$ containing 10, 11 or 12 C, R^1 or R^2 but not both may have a side chain attached to the α C atom) are readily developed even with a thin layer of a polyvalent diazo developer and are less sensitive to developing fluctuations than the diazo compounds hitherto used. C. O. C.

Indophenazines as Catalysts in Dye Bleach Baths for Colour Photography. General Aniline.

USP 2,627,461

Compounds of formula



(Z^1 and Z^2 = same or different atoms to complete a carbocyclic aromatic ring system of the benzene, naphthalene or anthracene series; R = monocyclic Ar) are yellow to reddish-orange, have no affinity for a stain gelatin and do not affect the quality of the final dye image when used as catalysts in acid bleaching baths. C. O. C.

X—SIZING AND FINISHING

Table for Determining the Condition of Steam and Air Mixtures in Driers. H. Vits. *Melliand Textilber.*, 34, 222–223 (March); 346–348 (April); 452 (May); 545–548 (June 1953).

Such a table is described, together with its development and use. With the help of conventional measuring devices all important factors can be determined graphically. H. E. N.

Thermodynamics of Mercerisation of Cellulose—I.B. G. Rånby. *Acta Chem. Scand.*, 6, 101–116 (1952).

The transformation of native into mercerised cellulose is characterised by the following effects: (1) the crystal lattice is changed from Cellulose I to Cellulose II; (2) the degree of crystallinity is lowered; (3) the micellar fibrils retain their thickness but become shortened from 500 Å to 300–400 Å; (4) the density is decreased, probably because of the changed crystal lattice; (5) the cellulose is not chemically altered. There is a little degradation but the impurities are removed; (6) the process is exothermic. The heat liberated is composed of the heat of wetting, the heat of reaction of wet cellulose with alkali and the heat of transformation of the crystal lattice (~ 2 cal./g.); (7) the entropy increases.

These findings indicate that the transformation of wet native cellulose into wet mercerised cellulose is an exothermic and spontaneous process. At ordinary temperatures Cellulose II is stable, Cellulose I is metastable. That in Nature the latter is almost exclusively formed is not to be explained by a simple crystallisation mechanism but suggests the special influence of an enzyme system in the formation of cellulose. L. P.

Mothproofing Methods and Tests. J. Barritt. *Dyer*, 109, 905–910 (26 June 1953).

Types of materials to be proofed are outlined and the types of moths or beetles whose larvae could consume or eat wool. Methods of protection include the spraying of wool and storage places with an insecticide or dust, storage in an atmosphere inimical to moth life and addition to wool of a substance rendering it immune to attack. Such substances may give protection during storage or, as with the so-called permanent moth-proofing agents, withstand all the agencies to which the proofed wool may be subjected during its useful life. Earlier moth-proofing agents such as Martius Yellow, dinitro-*o*-cresol and inorganic fluorides were of poor wash fastness. Modern moth-proofing agents of good wash fastness include Eulan CN, Eulan CN extra, Lanoc CN, and Mitin FF. These are soluble colourless dyes which can be applied to wool under normal dyeing conditions. Other moth-proofing agents include pentachlorophenol and D.D.T., the poor wash fastness of the latter being offset by its relative cheapness and the small quantity required. Results of wash tests on wool containing different moth-proofing agents are quoted and the effects of chemical processing and temperature of application considered. The choice of agent is briefly discussed. British tube and open jar tests are described, Continental modifications considered, and typical results illustrated. W. R. M.

Modification of Wool by the Application of Linear Synthetic Polyamides. III—Pretreatment of Wool. D. L. C. Jackson. *Text. Research J.*, 23, 616–622 (Sept. 1953).

It is shown that the presence of foreign materials such as soaps and oils interferes with the deposition of *N*-alkoxy-methylpolyamides when these are used for the prevention of felting shrinkage. The resin achieves its maximum effect if the fibre is cleansed using hot ethanol or alkaline hydrogen peroxide before treatment. It is suggested that both forms of pretreatment improve the adhesion between the fibre and the resin. A. B.

Action of Ninhydrin on Keratin. R. Cockburn, L. G. Jagger, and J. B. Speakman. *Nature*, 172, 75 (11 July 1953).

Ninhydrin has a powerful cross-linking action on protein fibres. With wool keratin the extent of the reaction is independent of pH within the range pH 4.8–8.3, and though slow at ordinary temp., reaction is very rapid in

boiling 0.0685 μ . soln. at pH 4.8, and after 15 min. the fibres show a 25-8% increase in resistance to a 30% extension in water at 22.2 c. Inhibition of the strengthening effect when the lysine side-chains are blocked, or when completely deaminated fibres are used, indicates the fundamental part played by the basic side-chains of the keratin. The effect is even more striking with damaged wool fibres which, after reaction, may acquire greater resistance to extension than that of the original fibres. Compounds related to ninhydrin which give uncoloured derivatives should find wide application in the reinforcement of both natural and synthetic protein fibres.

J. W. D.

PATENTS

Size for Yarns for Tyre Cords. Firestone Tire & Rubber Co. USP 2,626,887

An aqueous dispersion containing a water-insoluble lubricant, a polyalkyleneoxide and an alkali metal alkaryl sulphate used to condition rayon yarns before they are twisted into cords gives good protection to the fibres during processing, higher adhesion to rubber than is obtained with conventional oil and wax lubricants, and results in a tyre cord of improved fatigue life.

C. O. C.

Imparting Crease-resistance and Dimensional Stability to Cellulosic Textiles and Fibres. Nederlandse Organisatie voor Toegepastnatuurwetenschappelijk Onderzoek ten Behoeve van Nijverheid, Handel en Verkeer. BP 698,135

The material is treated with an aqueous solution of a compound of formula



(X = O or S; n = 2-9; one or more of the CH₂ groups may have one or both H atoms substituted) and an acid catalyst, dried below 100°C. and then lightly washed.

C. O. C.

Conditioning Nylon Yarn by Deep Freezing. Foister, Clay & Ward. BP 697,800

Thrown nylon yarn in wound packages is treated at -120°F. for about 45 min. after which it requires no further treatment before it is knitted. The treated yarn has the appearance of silk.

C. O. C.

Sheer Nylon Hosiery. Scott & Williams.

USP 2,601,451

Nylon yarn is knit into a tube and then heat set so as to impart to it permanent crinkles corresponding to the loops of the knit fabric. It is then unravelled and the yarn knit up into ladies hose and boarded on the normal manner. This yields stockings which, though plain knit, have an irregular stitch structure showing no vertical streaks or shadows.

C. O. C.

Impregnating Textiles with a Mixture of a Vinyl Resin and a Rubberlike Material. Brevets Filastie et Procédés Bongrand. BP 697,847

Textiles are rendered elastic, flexible and resistant to wear and chemicals by impregnating and coating them with a mixture of an aliphatic vinylic resin, e.g. polyvinyl chloride, and a vulcanised rubber-like material.

C. O. C.

Water Impermeable, Water Vapour Permeable Coating. Wingfoot Corp. USP 2,626,941

An aqueous dispersion or an organic solvent solution of a water repellent coating material is compounded with finely divided, solid, non-porous fillers or pigments in amounts not less than that represented by the formula

$$x = 45.87 + 21.44_y - 0.938_y^2 + 1.625_y^3$$

(x = g. of filler/100 c.c.m. of coating material; y = 0-1% of the wet density (in lb./c.ft.) of the filler. Applied to textiles or similar bases it yields a water impermeable coating which has a much higher water vapour transmission rate than the usual coated fabrics.

C. O. C.

Coating Fabric or other Flexible Base with Polyvinyl Chloride Compositions. Gevaert. BP 698,266

The polyvinyl chloride is mixed with plasticisers at room temperature and then heated until it can be ground into powder. This powder is then spread on the base and bonded to it by heat and pressure.

C. O. C.

Pile Fabrics. BrC.

BP 697,738

An adhesive-coated fibrous web travels through two high-voltage fields in succession, its path through the first being substantially horizontal, or at > 45° to the vertical, and through the second downwards at > 45° to the

horizontal. While passing through the first field loose fibres are dropped on the web and are oriented magnetically with their long axes perpendicular to the adhesive surface, the rate of feed being such that some are attached and the others are not, being supported by the first. The second field orients part of the unattached fibres and brings some of them against the adhesive; the others fall off. The web is finally passed through a hardening zone, e.g. a radiant heat cabinet.

BP 697,739

Pile fabrics of the above type comprise cellulose acetate as a major constituent of the fibre and/or web, and an adhesive containing a basis of synthetic rubber which is a butadiene-acrylonitrile co-polymer, in which there is not < 20% by wt. of acrylonitrile. Such a polymer can be made very sticky prior to vulcanisation, particularly by adding suitable plasticisers which include a volatile component which is driven off during hardening. This greatly assists fibre adhesion during formation of the pile.

J. W. B.

Cloth-like Material from Cellulose Fibres without Spinning or Weaving. E. Eisenhut. BP 698,123

Firm, washable materials resembling woven cloth are produced without spinning and weaving by bringing a fleece consisting wholly or mainly of regenerated cellulose fibre into contact with an alkali solution containing 5-15% of NaOH at -5 to +25 c. for a few sec.-1 min., neutralising, rinsing, and drying. By conveying the fleece between fine mesh nets and imparting a slight gripping pressure towards the end of the process a durable and distinctive finish is imparted.

J. W. B.

Sponge Rubber-Textile Combination Material. Commonwealth Engineering Co. of Ohio. BP 697,705

A combined sponge rubber-textile material which can be used, e.g. as carpeting without requiring underfelt, is made by mixing rubber latex, which can be synthetic, e.g. neoprene, with a solution of an alkali metal silicate, foaming the mixture by mechanical action or by introducing a gas under pressure, e.g. nitrous oxide, applying the foam to the back of the carpet, etc., and curing.

J. W. B.

Cropping Knitted Fabric. Ridley, Spriggs & Johnson. BP 696,490

Loose ends of splicing yarn in knitted fabrics are cropped by placing the garment over a frame and traversing a power operated clipper over the surface. A suction device incorporated with the clipper presents the end for cutting and removes the cut yarn.

G. E. K.

Finishing Felt and Felt Hat Bodies. I. Kaufman. USP 2,626,732

A velour finishing process for embossed hat bodies.

C. O. C.

Contracting or Relaxing the Whole or Part of a Garment. Trubenized (Gt. Britain) Ltd. BP 697,682

That part of the garment formed of two piles of fabric which have not been fused together is passed between two flexible thick belts which are bent so as to stretch the surface of each belt. The belts are then straightened while the garment is between them so that the dimensions of the engaged part of the garment alters as those of the belt surfaces alter.

C. O. C.

Static Electricity in Textile Fibres (VI p. 511).**Modifying Polyester Fibres** (VIII p. 515).**Measurement of the Forces of Liquid Retention by Wet Paper-making Fibres** (XIV p. 523).

XI—PAPER AND OTHER CELLULOSIC PRODUCTS

Colouring of Paper Stock. B. J. R. Carey. *Proc. Tech. Sect. British Paper & Board Makers' Assoc.*, 34, 311-328 (June 1953).

Factors affecting the colouring of paper stock, including pigments, dyes, addition sequences, toning colour, and the base furnish are discussed, in addition to colour nomenclature, and matching under laboratory and mill conditions. The dispersing of colours, the construction of a colour store, and colour blindness are also considered.

S. V. S.

Press Felt and its Water Content. K. F. Hansson. *Svensk Papperstidning*, 16, 625-633 (31 Aug. 1953).

The properties of the woollen fibre and felt and the factors affecting the water content are discussed. De-watering is increased by using as little as 0.01% Teepol, $R\text{-CH}(\text{CH}_3)\text{-O-SO}_3\text{Na}$, and by raising the temperature to lower the viscosity of the water. The water content after the press nip, expressed as moisture regain (k) has been investigated under different line presses (p) and speeds, resulting in the relation $k p C_1 - C_2$, the constants C_1 and C_2 varying with the speed. With other factors constant, the water content of the felt after the nip is higher at higher speeds, and more water in the felt before the nip results in a slightly lower dryness after the nip at constant speed and linear pressure.

S. V. S.

Bindarine as an Addition Agent in the Deposition of Copper. *Canadian J. Technol.*, 31, 114-119 (April-May 1953).

Bindarine, a by-product of the sulphite pulp industry, is used extensively as an additive to the electrolyte bath in the deposition of copper; it increases both the hardness of the deposited copper, and the cathodic polarisation, these effects being reduced when gelatine is the additive. The effectiveness of Bindarine has been shown to be due to its lignosulphonate content; it is, however, absorbed only to a limited extent on a copper cathode. The associated experimental work is described.

J. W. D.

Physicochemical Examination of Bacterial Cellulose. B. G. Rånby. *Arkiv Kemi*, 4, 249-256 (1952).

Electron-microscopic examination of cellulose produced by *Azobacter xylinum* showed that it is constructed of the same micellar fibrils as vegetable cellulose. Mercerisation is also similar. The degree of polymerisation from viscosity is about 2600.

L. P.

Physicochemical Examination of Animal Cellulose (Tunicin). B. G. Rånby. *Arkiv Kemi*, 4, 241-249 (1952).

The shells of some tunicates (Ascidiae) contain N-free carbohydrate with a similar structure to plant cellulose. Electron-microscopic examination shows that this substance also consists of micellar fibrils ~ 100 -120 Å wide (wood cellulose 80-100 Å). The following differences from wood cellulose were established: the degree of crystallinity is higher; the lowest concentration of NaOH necessary for mercerisation is also higher; the degree of polymerisation is of the order 4000; the micellar fibrils are more resistant to mineral acid. No chemical difference between animal and vegetable cellulose could be established.

L. P.

Viscosity Number-Molecular Weight Relationship for Celluloses and Investigations of Cellulose Nitrates in Different Solvents. E. H. Immergut, J. Shurz, and H. Mark. *Sitzungsber. Öster. Akad. Wiss.*, 162, (3-4), 219-249 (1953).

The viscosity numbers and molecular weights for a series of technical celluloses are determined in Cu-ethylene-diamine solution, after which they are nitrated to a nitrogen content of $\sim 13.9\%$ and the molecular weight of the nitro-cellulose measured osmotically in acetone, and the viscosity number η in acetone, ethyl acetate and ethyl lactate. From the data obtained the empirical relationship, $[\eta] = 1.33 \times 10^{-4} M^{0.90}$ is derived, which enables the characterisation of technical celluloses of polymerisation degree 90-3000. Ethyl acetate is the best and acetone a less efficient solvent. The influence of the velocity gradient during the determination of viscosity is appreciable at molecular weights over 300,000.

H. H. H.

Detection and Determination of "End Groups" in O-Methylcelluloses. D. I. McGilvray. *J.C.S.*, 2577-2582 (Sept. 1953).

Tetra-O-methylglucose end groups are detected and determined in hydrolysates of O-methylcelluloses, and their presence has been demonstrated in O-methyl-celluloses which are soluble in chloroform-light petroleum (1:1) of degree of polymerisation ~ 1000 , and also those insoluble and of greater chain length. This evidence is contrary to that upon which Haworth (*Chem. and Ind.*, 17, 917 (1939)) formulated his theory of the behaviour of cellulose during methylation. The results do not exclude the possibility that the original cellulose may be branched to a slight extent. With the rigorous exclusion of oxygen to minimise degradation during methylation, a high % of the product is insoluble in the above solvent. These

insoluble materials however, do not yield evidence for sound conclusions as to the structure of the original molecule.

H. H. H.

Heats of Wetting of Acetylated and Methylated Polysaccharides. T. Nakagawa. *Bull. Chem. Soc. Japan*, 26, 227-228 (July 1953).

Acetylated and methylated polysaccharides have lower heats of wetting by water than the unacetylated or unmethylated materials. This supports the view that heats of wetting of polysaccharides are mainly due to interaction between their hydroxyl groups and water.

W. R. M.

Polysaccharides associated with Cellulose. G. A. Adams and C. T. Bishop. *Nature*, 172, 28-29 (4 July 1953).

Holocellulose was obtained from extractive-free wheat, oat, and barley straw, and jute fibre, by treatment with acid chloride. These holocelluloses, together with purified cotton linters and wood pulps, were converted to α -celluloses by treatment with 17.5% alkali, these being subsequently hydrolysed to soln. of the simple sugars. After removal of the acid, oxidation of the glucose, clarification, and concentration to small volume, the soln. were subjected to paper chromatography. The results of these analyses are tabulated. D-Xylose is associated with all except the cotton fibre, and L-arabinose is absent only from cotton and softwood sulphite pulp (the proportion in hardwood pulp is very small). D-Mannose appears only in sulphite pulp derived from softwood. Though uronic acid (as its anhydride) is recorded as being present in the α -cellulose derived from all the sources examined, its presence in certain of them is open to doubt. The results are discussed. It is not known whether the non-glucose constituents are chemically joined to the cellulose molecule, or merely associated physically.

J. W. D.

PATENT

Carbon Paper. U.S. Secretary of the Navy.

USP 2,626,884

A smoked recording paper which can be made in bulk and handled without danger of offsetting or otherwise impairing its sensitivity.

C. O. C.

New Reactions of Native Lignin (XIV p. 522).

Measurement of the Forces of Liquid Retention by Wet Paper-making Fibres (XIV p. 523).

XII—LEATHER; FURS; OTHER PROTEIN MATERIALS

Silica Tanning. IV. P. Chambard and R. Lasserre. *Bull. assoc. franç. chim. ind. cuir.*, 10, 192-6 (1951); *Chem. Abs.*, 47, 9650 (25 Sept. 1953).

Solutions containing 2.5% SiO_2 and of pH 3.2 were prepared by adding aq. Na_2SiO_3 to a mixture of HCl and acetic acid. Bated calf skin was pickled with $\text{NaCl} + \text{HCl}$ or $\text{HCl} + \text{acetic acid}$ and tanned with either 7.5% SiO_2 (A) or 10% SiO_2 (B) on the pickled skin weight. After 48 hr., the pH was raised during 24 hr. to 3.9. The leathers were rinsed and brought to pH 4.5. The tanned leathers contained SiO_2 20% (A) and 25% (B) per 100 collagen and shrank at 73.5°C. and 78°C. respectively. Leather B was well tanned, smooth, supple and not brittle. In tanning tests with deaminised skin fixation of SiO_2 was no lower and the shrink temperature was 81-3°C.

C. O. C.

Aqueous Acrylate Coating Colours for Use on Chrome Leather. K. P. Zabolin and V. P. Zheltov. *Legkaya Prom.*, 12 (2) 32-3 (1952); *Chem. Abs.*, 47, 9619 (25 Sept. 1953).

Introduction of high-molecular hydrophilic groups into polymethacrylate makes it suitable for use on chrome leathers. The coating is frost- and water-resistant, can be stretched 6-7 times its length, and is stable to ageing. It is applied like a casein colour. It is thought that acrylates will replace cellulose nitrate colours.

C. O. C.

Contribution of Side-chains to the Infrared Spectra of Proteins—the 6.5- μ . Band. G. Ehrlich and G. B. M. Sutherland. *Nature*, 172, 671-672 (10 Oct. 1953).

Absorption spectra of the carboxyl groups of synthetic polymeric acids and ampholytes in solutions of heavy water are studied and the absorption spectrum for polymethacrylic acid is shown. It is suggested that conclusions,

based on the frequency criteria of Ambrose and Elliott (*Proc. Roy. Soc., A*, **208**, 75 (1951)), must be treated with reserve unless it can be demonstrated that the contribution of COOH groups has not been significantly altered.

J. W. B.

Possible Role of Proteolytic Enzymes in Protein Synthesis. R. B. Lofthill, J. W. Grover, and M. L. Stephenson. *Nature*, **171**, 1024–1025 (6 June 1953).

Disulphide Interchange Reaction. F. Sanger. *Nature*, **171**, 1025–1026 (6 June 1953).

During experiments on insulin, cystine peptides are separated from a partial acid hydrolysate and their structures determined after oxidation to the corresponding cysteic acid peptides. It is found that more cystine peptides are present than can be accounted for by any one unique insulin structure; a transfer reaction which occurs during hydrolysis is suggested—



Experiments which support this theory are described.

J. W. B.

Degradation of Methionine by Hydrogen Peroxide. Y. Matsuo. *Nature*, **171**, 1021–1022 (6 June 1953).

Oxidation of methionine-containing proteins with hydrogen peroxide leads to the appearance of additional spots on subsequent chromatograms. Results are discussed and a scheme is suggested for the oxidative degradation of methionine. It is found that α -aminobutyric acid can so be derived from methionine, via the sulfoxide or possibly the sulphone.

J. W. B.

Effect of Gelatin on the Thermal Decolorisation of Tri-carboyanine Dyes, and the Chemical Nature of the Accelerator Component of Gelatin (IV p. 507).

XIII—RUBBER; RESINS; PLASTICS

Transcrystallisation in High Polymers. E. Jenckel, E. Teege, and W. Hinrichs. *Kolloid-Z.*, **129**, 19–24 (Nov. 1952).

Under suitable conditions, transcrystallisation can be observed in sections of polyurethane and polyamide filaments but not in polyethylene and probably not in polyesters. Transcrystallisation as here understood corresponds to the nomenclature in metallurgy, in which crystallisation in long rods takes place perpendicularly to the cooled surface and develops internally. Afterwards these crystalline sectors of its inner structure are round spherulites.

L. P.

Frictional Electrification of Polar Polymers. J. A. Medley. *Nature*, **171**, 1077 (13 June 1953).

The development of the positive and negative charges acquired respectively by bases and acids (especially organic) is facilitated by sorbed water molecules, not necessarily forming a separate phase. Excess protons or hydroxyl ions are contributed by the acid or base; these latter, the smaller ions, are more mobile than their companions, which tend to aggregate. Polar polymers such as textile fibres and ion-exchange resins are particularly suitable for such studies, their acid or basic groups promoting water sorption and consequent ionic dissociation and mobility even at low humidities. One ion is firmly bound to the polymer matrix, whilst the other is free to participate in charge transfer. The consistent development, at $\sim 30\%$ R.H., of a +ve charge by a strongly acidic resin (sulphonated polystyrene) and a +ve charge by a strongly basic one (Deacidite FF) shaken from a filter paper, has been demonstrated. Weak bases and acids, if carefully neutralised, behave similarly. Such a mechanism probably accounts for the acquisition of a +ve charge by polypeptides against cellulose. Reversals of charge such as that which results from the prior treatment of horn keratin with NaOH (from +ve to -ve) obtain also with ion-exchange resins.

J. W. D.

New Method of Polymerisation of Vinyl Compounds.

I—Polymerisation of Methyl Methacrylate with Copper or Cuprous Chloride and Acids at Room Temperature. R. Inoue and T. Yamauchi. *Bull. Chem. Soc. Japan*, **26**, 135–137 (April 1953).

The polymerisation of methyl methacrylate occurs catalytically with Cu or Cu₂Cl₂ and acids at room temperature. The accelerating power of organic acids decreases

with increasing molecular weight. It is suggested that polymerisation is initiated by H atoms.

W. R. M.

Breakdown of Methyl Methacrylate Polymer by High-energy Radiation. A. Charlesby and M. Ross. *Nature*, **171**, 1513 (27 June 1953).

When polymethyl methacrylate (Perspex) is exposed to high-energy radiation it does not develop cross-links as do certain other long-chain polymers, but shows rapid breakdown after relatively short radiation doses. Certain doses which are short enough to cause no visible breakdown so modify the material that subsequent heating leads to internal bubbling and an expansion to 6–8 times the original volume. Possible industrial application is suggested.

J. W. B.

Irradiation of Polymers by High-energy Electrons.

E. J. Lawton, A. M. Bueche, and J. S. Balwit. *Nature*, **172**, 76–77 (11 July 1953).

Polymers, upon irradiation with electrons whose peak energy is 800 kV., applied within the dosage range of one to several hundred million röntgen units, tend to fall into two broad classes when subsequently examined by determinations of solubility, swelling, gas evolution, and physical properties. (1) Polymers which become cross-linked—polyacrylic esters, polystyrene, polyesters, nylon, polyethylene, chlorinated polyethylene, natural rubber, GRS, butadiene-acrylonitrile copolymers, neoprenes W and GN, polydimethylsiloxanes, and styrene-acrylonitrile copolymers. (2) Polymers which are degraded—polymethyl methacrylate, polyvinyl chloride, polyvinylidene chloride, polytetrafluoroethylene, cellulose, and polyisobutylene. With polyethylene there is evolution of hydrogen during irradiation, and the amount evolved is, like the degree of cross linking, proportional to the amount of the irradiation. Hydrocarbon compounds up to C₁₁ are also evolved, and changes occur in the infrared spectrum. The amount of irradiation required to render polyethylene insol. varies inversely as (mol. wt.)¹⁻²⁵. Cross-linking efficiency (as shown by swelling measurements) is independent of temp. over the range -74°C. to +193°C. and of dosage rate as represented by the application of 30 million röntgen units during 1 min. or 30 min. Nylon and polydimethylsiloxane behave similarly.

J. W. D.

Proton-acceptor Properties of Deeply Coloured cyclopentadiene Polymers. B. Eisler and A. Wassermann. *Nature*, **172**, 73–74 (11 July 1953).

cyclopentadiene can be converted catalytically, by trichloroacetic acid, into a brown-red polycyclopentadiene-trichloroacetic ester (I) which yields, with strong acids in sufficient concn., a blue-black mol. cpd. (II). The reaction—



has been investigated quantitatively, (HA) being the three chloroacetic acids, and the equilibrium const. for the reaction is defined and discussed. The results of equilibrium and electrical conductivity measurements in benzene soln. are given. Relatively strong proton acceptors such as piperidine, dioxan, ethanol, or acetone, suppress the formation of (II), but polar aprotic solvents such as nitrobenzene or chloroform do not; this is consistent with the postulation of a proton transfer mechanism in the reaction. Other favourable evidence is adduced.

J. W. D.

PATENTS

Acid-curing Thermosetting Aminoplast Resins.

American Viscose Corp.

BP 698,170

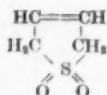
Salts of quaternary hexamethylenetetraminium bases of formula (C₆H₁₂N₄)_nR_nX_p (R = Alk, alkylene, alkenyl, alkylidene or cycloalkyl, an aryl subst., aliphatic hydrocarbon or mono subst.; Alk = X = anion of an acid which accelerates curing; m, n and p = 1 or 2 the possible combinations being (p = 1, m = 1, n = 1), (p = 1, m = 2, n = 2) and (p = 2, m = 2, n = 1)) are latent curing catalysts for acid-curing thermo-setting resins. Compositions in which they are used are stable at ordinary temperatures and show improved curing and moulding properties.

C. O. C.

Stable Thermosetting Formaldehyde-Amide Composition with a Butadiene Sulphone Curing Catalyst. Libby-Owens-Ford Glass Co.

USP 2,625,083

Butadiene sulphone

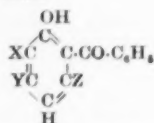


and its 2-methyl or 2:4-dimethyl derivatives are potentially acid catalysts which impart extremely rapid curing properties to formaldehyde-amide moulding compositions without affecting plasticity or stability when the compositions are stored for a long time.

C. O. C.

Stabilised Vinylidene Chloride Compositions. Distillers Co. BP 697,798

Compounds of formula



(X and Z = H or CH₃; Y = H, Cl or CH₃) stabilise vinylidene polymers and copolymers to light. C. O. C.

Embossing Plastic Sheets. E. Freedman and E. J. Jacob. BP 697,849

Non-glossy embossed effects are produced on thermoplastic sheets of a thin layer of non-metallic materials is placed between the plastic sheet and the embossing die. The non-metallic material should be such that it is at least partly disintegrated during embossing and is removed from the embossed plastic by brushing or washing.

C. O. C.

Linoleum Scratch Compositions. Monsanto Chemical Co. USP 2,626,936

Linoleum "scratch" (a mouldable or calendarable mixture of pigment, filler and binder) is prepared by (1) making an aqueous slurry of pigments, extenders and a copolymer of a vinylidene compound with an $\alpha\beta$ ethylenically unsaturated acid (2) converting this slurry into a pigment paste have dispersant properties (3) using the converted slurry to disperse a binder in water (4) incorporating a filler into the resulting emulsion until it breaks, and (5) drying the precipitate.

C. O. C.

Ethylene-Alkyl Acrylate-Alkylbutene-1:4-dioic Acid Esters (III p. 504).

Paints and Coloured Plastics (V p. 511).

Two Structural Modifications of Solid Synthetic Polyamides (VI p. 513).

Structure and Behaviour of Linear High Polymers as Exemplified by Polyethylene Terephthalate (VI p. 514).

Insolubilisation of Polycarbonamides containing Tertiary Nitrogen in the Chains (VI p. 514).

XIV—ANALYSIS; TESTING; APPARATUS

Co-ordinate Compounds of Iron with some Hydroxycarboxylic Acids. K. Shibata and T. Noguchi. *Bull. Chem. Soc. Japan*, 26, 197-200 (June 1953).

Chelating action of salicylic, sulphosalicylic, and 2-hydroxy-3-naphthoic acids towards iron has been studied. These acids combine in a 1:1 molecular ratio with iron. It is concluded that sulphosalicylic acid is the most suitable as a reagent for the colorimetric determination of iron. More suitable reagents for this purpose should be obtained by the further introduction of sulphonyl groups in salicylic acid.

W. R. M.

Microanalysis of Organic Salts by the Use of Cation-exchange Resins. C. H. Van Etten and M. B. Wiele. *Anal. Chem.*, 25, 1109-1111 (July 1953).

Organic salts may be determined on the micro scale by passing their soln. through an exchange column containing a resin which is unfunctional and of high capacity. The effluent contains acid equivalent to the salt content of the original soln., and this may be titrated. If desired the titration can be checked by re-running the titrated effluent through the column and repeating the titration. Successful analyses of 46 organic salts are reported, and the method, which is rapid, simple, and accurate, is detailed. The preparation of the ion-exchange resin is described, and there is a diagram of the apparatus.

J. W. D.

Sodium Carboxymethyl Cellulose—Determination of Degree of Substitution Active Agent. C. V. Francis. *Anal. Chem.*, 25, 941-943 (June 1953).

Uranyl carboxymethyl cellulose is pptd. by means of a soln. of uranyl nitrate; the ppt. is washed with alcohol and determined gravimetrically. The recovery on a number of different samples was found to be $\leq 98\%$, and the precision within ± 0.01 on the degree of substitution. The method has several advantages over others in current use—it is universally applicable to all commercially available materials, requires only 2-4 hours to complete, and calls for no special equipment or experience; it is described in full.

J. W. D.

Paper Chromatography of Polyethylene Oxide.

S. Kume, T. Yamamoto, K. Oozai, and S. Fukushima. *Bull. Chem. Soc. Japan*, 26, 9396 (Feb. 1953).

Paper chromatography, using fluorescein as indicator, can be applied to polyethylene oxide in the mol. wt. range 1000-5000 and gives a simple new method of determining the average mol. wt. in this range.

W. R. M.

New Spraying Reagents for the Detection of Reducing Sugars on Paper Chromatograms. S. Hirase, C. Araki, and S. Nakanishi. *Bull. Chem. Soc. Japan*, 26, 183-184 (June 1953).

Several aminophenols have been examined as colour reagents for reducing sugars. An alcoholic solution of α -aminophenol acidified with phosphoric acid is found to be the most useful reagent in respect of its sensitivity and specific colours for various types of sugars.

W. R. M.

Stable, Sensitive Linear Starch Indicator Solution for Iodimetry. J. L. Lambert. *Anal. Chem.*, 25, 984-985 (June 1953).

Linear potato starch fraction, twice recrystallised from 1-butanol, is dissolved in boiling distilled water and filtered, whilst hot, through highly retentive filter paper. When cool it is acidified with 50% acetic acid. Extremely sensitive end-points are obtained with this indicator, the intense blue colour of linear starch tri-iodide being free from the purplish tint associated with the branched starch fraction, or with partially degraded starches. Undissociated CH₃COOH in the indicator soln. competes successfully for the hydrogen bonding sites on the linear starch molecule, and thus maintains it in colloidal soln.

Anomalous Flow of Liquids through Capillaries and Measurement of Viscosity. G. F. N. Calderwood, H. W. Douglas, and E. W. J. Mardles. *Anal. Chem.*, 25, 935-937 (June 1953).

Several of the precautions essential to high precision in standard U-tube viscometry when water at 20°C. is the sole calibrating liquid are of even greater importance in microviscometry. Unless viscometers are scrupulously clean, the flow time of water is affected by the meniscus resistance (Jamin effect) and by change in average head of hydrostatic pressure due to different contact angles. In microviscometry the Poiseuille equation must be modified to allow for the reversal of flow at the meniscus; unless the length of liquid is ≤ 100 times the capillary diameter, abnormal values are obtained, especially at low rates of flow. Experimental studies of these effects are detailed.

J. W. D.

Polarographic Oxidation of Phenolic Compounds.

V. F. Gaylor, P. J. Elving, and A. L. Conrad. *Anal. Chem.*, 25, 1078-1082 (July 1953).

A polarographic method, using an indicator graphite electrode, has been developed for studying the oxidation of organic compounds and has been applied particularly to phenolic compounds. The study of phenol, quinol, 2,4-dimethyl-6-tert-butylphenol is reported at length. Comparable data on the ease of oxidation of a large number of compounds can be rapidly obtained. It is essential to standardise the experimental conditions; variation in polarisation rate, 3H, temp., and concn. may affect either the half-wave potential or the diffusion current, or both. These variables are easily controlled; the effect of each is discussed.

J. W. D.

Spectrophotometric Determination of α -Phenylphenol with Titanium Sulphate. P. H. Caulfield and R. J. Robinson. *Anal. Chem.*, 25, 982-983 (June 1953).

Colour reactions between phenols and Ti⁴⁺ in conc. H₂SO₄ soln. are well known, though only that involving thymol (for the determination of Ti) has received much

attention. The paper describes the application of this reaction to *o*-phenylphenol, which is used as a preservative for casein paints, leather finishes, and sizing materials. The *o*-phenylphenol, after separation by suitable means, is caused to react with the Ti reagent under specified conditions, and the optical density of the resulting soln. is measured at 450 $m\mu$, the determination being completed by recourse to a calibration curve. Beer's Law is obeyed over the range 4–160 $\mu g.$ of *o*-phenylphenol per ml. of Ti reagent. The wave-length of max. absorption, and the specific extinction coefficient for each of the complexes formed between Ti^{4+} and 27 phenols are listed. J. W. D.

Investigation by Use of Double Column Chromatography of Artificial Colouring Matters in Foods derived from Fruit. G. Jakovliv, A. I. Gx, and G. Colpé. *Ann. fulv. et frutes.* **46**, 169–171 (1953); *Chem. Abs.*, **47**, 9519 (25 Sept. 1953).

Prepare a 25% soln. of the sample, mix 50 c.c. with 10 c.c. 20% (by vol.) H_2SO_4 and 25 c.c. isomylalcohol, separate the alcohol layer after heating at 100°C., and run through a 25-cm. column of alumina. After elution with 15 c.c. 30% ethanol, evaporate at 100°C., add 20% H_2SO_4 and isomylalcohol as before, and pass through an identification column (Jakovliv and Colpé. *Chem. Abs.*, **47**, 1301 (1953)). The filtrate that passed the first column is also passed through an identification column. Finally an extraction with isomyl alcohol in absence of H_2SO_4 is used in a third identification column. C. O. C.

Vanadimetric Estimation of Indigo and Indigo Carmine. G. G. Ras and M. N. Sastri. *Current Sci. (India)*, **21**, 189 (1952); *Chem. Abs.*, **47**, 9217 (25 Sept. 1953).

$NaVO_3$ is better than $KMnO_4$ for oxidising indigo or indigo carmine to isatin. Mix an aliquot of indigo sulphate soln. with a known volume of standard $NaVO_3$ soln. in presence of acid. When the blue disappears titrate the excess $NaVO_3$ with standard $FeSO_4$ soln. Two moles of $NaVO_3$ are required for 1 mole of indigo sulphate. A little oxalic acid accelerates the reaction and causes no error. C. O. C.

Identification of Flavones by the Ultraviolet Absorption Spectra of their Ions. G. H. Mansfield, T. Swain, and C. G. Nordström. *Nature*, **172**, 23–25 (4 July 1953).

The ultraviolet absorption spectra of the ions of many polar-substituted compounds differ markedly from those of the compounds themselves, the main band being shifted $\sim 20 m\mu$ towards the red, and increased in intensity. With compounds containing a number of similar polar groups (e.g. the flavones) each group contributes to the total bathochromic shift on ionisation, and if one or more is blocked (e.g. by methylation or glycosylation) the resulting shift is substantially different. The application of this principle to the identification of flavones and flavone glycosides in quantities too small for the use of normal chemical methods (e.g. as separated by paper chromatography) is described. The method, which is given in full, consists briefly in the study of the ultraviolet spectra of these compounds first in ethanol and then in sodium ethoxide soln. Numerous data are given, together with spectral curves, relating to apigenin and five of its derivatives, and these are discussed at length. J. W. D.

Quantitative Determination of the Porphyrin Aggregate in Petroleum. S. Greenings. *Anal. Chem.*, **25**, 938–941 (June 1953).

The porphyrin aggregate is extracted with HBr in glacial CH_3COOH , transferred to $CHCl_3$, the volume being adjusted to give a transmittance between 20–50%. The light transmittance is measured using the two characteristic bands near 5000 and 5300 Å. Other bands are available if required. A graph relating transmittance to porphyrin concn. may be prepared using standard soln. of porphyrins isolated for the purpose. All experimental details are given. J. W. D.

Pigment Strength Testing with the Automatic Muller. G. E. P. Box, M. T. Hobbs, and F. North. *J. Oil & Col. Chem. Assoc.*, **36**, 283–304 (June 1953).

The palette method of testing pigment strength is subject to considerable error due to differences in the amount of

grinding applied by the test operator. Statistically designed experiments are detailed in which the palette method is compared with the use of an automatic muller which is now commercially available. This instrument may be preset to apply, automatically, 25, 50, 75, or 100 rubs, with a constant load of 50, 100, or 150 lb. Results obtained using the muller are of the same order of reproducibility as those obtained by a single skilled operator, though since the muller is less fatiguing in use than is the palette method, it may give greater accuracy in the routine testing of large numbers of pigment samples. With less skilled operators the muller gives better reproducibility, and even with skilled ones there is a person-to-person variation due to individual biases which is absent from the use of the muller. The rate of development of colour strength of a pigment in oil is difficult to determine by the palette method, and here the muller is markedly superior. There may be factors which have little effect in the palette method which are of greater significance with the muller, e.g. heat developed during grinding. It is thus urged that preliminary tests should be made before the results of the automatic muller are freely accepted. Even with this reserve the instrument is of considerable value. Discussions following the presentation of the paper at the Manchester and London sections of the Association are recorded at length. J. W. D.

Standardisation of Methods for the Analysis of Pigments. P. Colomb. *Lack- u. Farben-Chem.*, **4**, 115–119 (1950); *Chem. Abs.*, **47**, 9627 (25 Sept. 1953). German, Swiss and U.S.A. methods for examination of red lead are critically reviewed. C. O. C.

Photoelectric Determination of the Tinting Strength of White Pigments. W. Grassmann and H. Clausen. *Deut. Farben-Z.*, **7**, 211–215 (1953); *Chem. Abs.*, **47**, 9627 (25 Sept. 1953).

Previously known methods for determining the tinting strength of lithopone are critically reviewed. A new method consists of measuring the chrome from fixed amounts of a paste lithopone, ultramarine and vehicle and comparing it with the values of known standards. C. O. C.

Microchemical Tests used for Identifying Pigments and Mediums in a Fifteenth Century Painting. P. Coremans, R. J. Gettens and J. Thissen. *Studies in Conservation*, **1**, 1–29 (1952); *Chem. Abs.*, **47**, 9027 (10 Sept. 1953).

An account of a chemical and physical examination of a picture painted about 1464. The microchemical tests used are tabulated. C. O. C.

Bibliography of Fibre Analysis (1948–1953). E. M. Lynch. *Amer. Dyestuff Rep.*, **42**, P 596 (31 Aug. 1953).

Demonstration of Keratin with Aldehyde Fuchsin. H. R. Scott. *Nature*, **172**, 674–675 (10 Oct. 1953).

When mouse-skin is oxidised for 30 min. with acid permanganate it is found that subsequent staining with aldehyde-fuchsin affects only the cortex of the hair external to the skin, the shafts within remaining unstained. If the skin is oxidised with peracetic acid for 1–2 hr. both the stratum corneum and the hair shafts throughout their length are intensely stained, and with shorter periods of peracetic acid oxidation only the stratum corneum reacts. It is suggested that the "hard" keratin of the hair shaft is less susceptible to oxidation than the "soft" keratin of the stratum corneum. The experiments described indicate that aldehyde-fuchsin serves as an effective reagent for the demonstration of keratin after peracetic acid oxidation. J. W. B.

Development of a Scale Relating Refractive Indices of Ether Solutions of Wool Fat with Residual Fat Contents. G. Nitschke. *Faserforsch. und Textiltech.*, **4**, 388–392 (Sept. 1953).

Some improvements are introduced into the refractometric method, already reported (see J.S.D.C., **68**, 541 (Dec. 1952)), of estimating the fat content of washed wool, and as a result of further experimental work an improved calibration table is evolved. The limits of error are estimated at $\pm 0.2\%$ of residual fat for wool of any origin. A. E. S.

Osmotically Active Substances of the Allwörden Reaction.

G. J. Schuringa, T. Konings, and A. J. Ulbrich. *Text. Research J.*, **23**, 645-646 (Sept. 1953).

In this letter the authors describe experiments in which the sulphur distribution is determined in the bubbles obtained by the Allwörden reaction. A. B.

Spectrophotometric Determinations of Amino Groups.

D. Fraser and H. G. Higgins. *Nature*, **172**, 459-460 (5 Sept. 1953).

The reaction of diazotised sulphuric acid with glycine, lysine, arginine, and tryptophan has been studied spectrophotometrically. The preparation of the diazonium salts and their coupling with the amino acids is described. The extinctions at 363 μ for the azo derivatives of glycine and lysine both conform to Beer's law when referred to the initial amino acid concn. In the case of lysine the ϵ -amino group does not appear to take part in the reaction. The absorption max. for the arginine derivative is at 356 μ , and the extinction coefficient is lower than for glycine or lysine. With histidine and tyrosine there is evidence that the diazonium salt reacts preferentially with the imidazole and phenolic group, and tryptophan appears to react at both the indole and amino groups, but only slightly in the latter case. This method is preferred to ultra-violet absorptiometry for the study of protein constitution, and many intact proteins such as casein, gelatin, pepsin, and fibrin, have been examined; the main difficulty is in assessing the contribution of the imidazole, phenolic, and imino groups to the absorption at 363 μ , but in many applications this may not be very important. J. W. D.

Effect of Relative Humidity on the Reaction of Ninhydrin with Amino Acids on Paper Chromatograms.

E. F. Wellington. *Canadian J. Chem.*, **31**, 484-487 (May 1953).

With most amino acids max. colour development is realised only within a narrow range of humidity (35-40%), the colour intensity decreasing rapidly on either side of this max. Aspartic acid behaves anomalously, giving a pronounced min. in the region of 45-50% R.H. The apparatus (of which there is a photograph) and method are given fully. J. W. D.

Simultaneous Separation of Purines, Pyrimidines, Amino Acids, and Other Nitrogenous Compounds.—by Ion Exchange Chromatography.

J. S. Wall. *Anal. Chem.*, **25**, 950-953 (June 1953).

The separation by elution with HCl upon an ion exchange column, and the determination and identification of components by ultraviolet absorptiometry and the measurement of R_f values on paper, of mixtures including threonine, serine, glutamic acid, alanine, glycine, leucine, isoleucine, methionine, tyrosine, lysine, histidine, arginine, proline, and phenylalanine, is described and discussed. By this method ~97% of the N contained in bacterial hydrolysates was accounted for in 25 known isolated compounds. J. W. D.

Relation between Viscosity and Critical Micelle Concentration of Detergent Solutions.

N. Sata and K. Tyuzo. *Bull. Chem. Soc. Japan*, **26**, 177-183 (June 1953).

Methods of determining critical micelle concentration (C.M.C.) are discussed. New methods are described for determination of first and second C.M.C.s from viscosity measurements. A plot of $(\eta_r - 1)/C_m$ against C_m shows a minimum at the first C.M.C. η_r is the relative viscosity and C_m the concentration of detergent in moles/litre. A plot of η_r/C_m against C_m tends to a limiting value at the second C.M.C. η_{sp}/C_m equals $(\eta_r - 1)/(C_m - C_{m1})$ where η_r is the relative viscosity divided by its value at the concentration corresponding to the first C.M.C. (C_{m1}). Values of $[\eta_1]$ and $[\eta_2]$, the values of η_{sp}/C_m at the first and second C.M.C.s, are tabulated for a number of sodium soaps and other detergents and a relation found between these values and the molecular weight of the soap.

Leucometer for Examining the Degree of Bleaching of Textiles, Printed Textiles, Pale coloured Powders, etc.

G. Engeking. *Chim. anal.*, **35**, 129-132 (1953); *Chem. Abs.*, **47**, 8419 (10 Sept. 1953).

A new leucometer is described for measuring the pale colours of powders, determining the degree of bleaching of textiles, examining prints, etc. C. O. C.

Determination of Copper 8-Hydroxyquinolinoxide in Cotton Textiles—Spectrophotometric Method for Routine Control.

A. Darbey. *Amer. Dyestuff Rep.*, **42**, 453-455 (20 July 1953).

Copper 8-hydroxyquinolinoxide in mildewproofed cotton fabric is extracted by treating a 5-g. sample three times with 150-ml. portions of hot dil. HCl (200 ml. conc. acid per litre), using a covered beaker and taking 15-20 min. for each extraction; moderate heating is maintained on a hot-plate or steam-bath. The combined extracts are made up to 500 ml. with dil. HCl, and a portion is filtered (Whatman No. 42 paper) and measured spectrophotometrically at 365 μ in 1-cm. cells, using dil. HCl as a blank set at zero absorbance. Various other substances likely to be encountered are studied, and an account is given of their influence on the method. J. W. B.

Electrolytic Method for the Estimation of the Reducing Constituents of Pulps.

K. Schwabe and H. Schröder. *Faserforsch. und Textiltech.*, **4**, 261-263 (June 1953).

A 1% soln. of NaOH is electrolysed between Pt electrodes at a p.d. of 0.2 v. until the current falls to a const. value. Extract of pulp, obtained by treating it (1 g.) with boiling 1% NaOH (100 ml.) in absence of air for 15 min., is filtered and add to the cell, and the max. value of the increase in current (attained in 1-2 min.) is noted. The figures obtained show close direct correlation with copper numbers. A. E. S.

Estimation of Free Aldehyde Groups in Oxycelluloses.

G. M. Najar and C. V. Padmanabhan. *J.S.D.C.*, **69**, 295-297 (Aug. 1953).

New Reactions of Native Lignin.

K. Seifert. *Faserforsch. und Textiltech.*, **4**, 342-346 (Aug. 1953).

The reactions of 32 aromatic substance when treated with hydrochloric acid and phloroglucinol, *p*-phenylenediamine, or acetylacetone are observed. Colorations similar to those observed for wood occur when the aromatic cpd. has an unsaturated side-chain *para* to hydroxyl or alkoxy. It is found that a mixture of acetylacetone (8 g.) and hydrochloric acid (1.8 g., sp. gr. 1.15) will remove the whole of the lignin from wood (1 g.) in the form of an acetylacetone condensate. Thus, pine wood is first Soxhlet-extracted with benzene-alcohol (1:1) for two days and then heated with the reagent for 90 min. in the water-bath. The residual material, after being washed with acetone, is pure white; it is dried and weighed (42% on dry wood, elementary analysis corresponds to $C_6H_{10}O_5$, α -cellulose content 70%, no reactions for pentosans or lignin). The soln. is concentrated *in vacuo*, diluted with water, extracted with ether until a colourless extract is obtained, subjected to prolonged boiling with continual addition of water, and finally boiled down almost to dryness; the brown floccs that form during this operation are washed with water and ether, dried, and weighed (27% on dry wood, elementary analysis corresponds to lignin, methoxyl content 10%, mol. wt. ~900). The properties of this product and the probable course of the reaction between lignin and acetylacetone are discussed. A. E. S.

New Method for the Quantitative Estimation of Lignin.

K. Kürschner and T. Schweizpacher. *Faserforsch. und Textiltech.*, **4**, 287-293 (July 1953).

Methods based on methoxyl determination for the estimation of lignin are reviewed (26 references), and the disadvantages of the HI methods are examined. A method suitable for all kinds of natural materials (including leaves, pine needles, humus, bark, and other materials not readily treated by other methods) and their degradation products consists in the liberation of methoxyl as methanol by treatment of the material with 82% H_2SO_4 at 200°C., redistillation of the methanol in presence of alkali (to remove aldehydes and acids), oxidation of the methanol to CO_2 by alkaline $KMnO_4$, and titrimetric estimation of excess oxidant. The lignin content is derived from the methanol yield by multiplication of the latter by 5.5 (coniferous) or 4.0 (deciduous). A. E. S.

Determination of Hydroxymethyl Groups in Condensates of Urea and Formaldehyde.

J. I. de Jong. *Rec. Trav. chim.*, **72**, 653-654 (July 1953).

Formaldehyde is liberated from hydroxymethyl groups in alkaline soln. and this, together with any free HCHO

already present, may be determined by means of its reaction with cyanide ions to yield the cyanohydrin, the excess CN^- being back-titrated with $Hg(NO_3)_2$. The method, which is given in full, is superior to others such as the hypiodite method, in that it is applicable in the presence of other oxidisable substances such as ammonia and cellulose, and it may be applied directly to water-insol. condensates.

J. W. D.

Measurement of the Forces of Liquid Retention by Wet Papermaking Fibres. W. W. Barkas and R. Hallan. *Proc. Tech. Sectn. British Paper & Board Makers' Assocn.*, **34**, 289-310 (June 1953).

The forces holding water in a fibre mat are discussed with reference to the theory of capillary-held water, and this is applied to the drying of a fibre mat from the waterlogged state. A method of forming a fibre mat and determining its static equilibrium moisture content is described, results being plotted as hydrostatic tension/moisture content isotherms, which vary for different types of fibre. Beating increases moisture retention at high tensions, and the physical state of the fibres may be characterised by the moisture retention at 14 cm. Hg (chosen arbitrarily), which is compared with the freeness and strength of the pulps.

S. V. S.

Determination of Filler in Paper. J. Navarro. *Afinidad*, **30**, 52-55 (1953); *Chem. Abs.*, **47**, 8575 (10 Sept. 1953).

A system of qualitative analysis. The water-soluble part of the paper is tested for $CaSO_4$. The extract obtained with 6 N-HCl is tested for $CaCO_3$, $MgCO_3$, ZnS and Al_2O_3 . A sample of paper is ignited with NH_4NO_3 and the ash tested for oxides of Ca, Mg, Al, Zn, Si and Ti and $BaSO_4$. Appropriate combinations of components are interpreted as kaolin, talc and lithopone.

C. O. C.

Determination of Pentosans in Highly Purified Wood Pulp. E. D. Smith and L. N. Rogers. *Anal. Chem.*, **25**, 931-933 (June 1953).

The present standard TAPPI method for estimating pentosans is unsuitable for use with pulps containing $>1\%$ of these substances because the methods prescribed for furfuraldehyde analysis are of poor sensitivity, and there is uncertainty as to the amount of hydroxymethyl furfuraldehyde dist. over with the furfuraldehyde. Sensitive methods are now available for the determination of furfuraldehyde and of total aldehyde (by colorimetry and ultra-violet absorptiometry respectively). Proposed modifications to the TAPPI procedure, and the experimental work (statistically analysed) leading to them, are described. It should now be possible to correlate the properties of highly purified wood pulps with their pentosan contents.

J. W. D.

Investigations of Lignin and Cellulose. I—New method of Estimation of Ligninsulphonic Acid in Sulphite Liquor by Colloid Titration. V. R. Senzyu. *Bull. Chem. Soc. Japan*, **26**, 143-147 (April 1953).

The indirect method of colloid titration is applied to the estimation of ligninsulphonic acid in sulphite waste liquor. 0.01 N. Glycol chitosan solution is added to the well diluted sulphite liquor and the excess titrated with 0.0025 N. potassium polyvinyl sulphate soln., using toluidine blue as indicator. The influence of pH is discussed. W. R. M.

Investigations of Lignin and Cellulose. II—New method of Estimating Lignin in Wood and Cellulose by Colloid Titration. V. R. Senzyu. *Bull. Chem. Soc. Japan*, **26**, 148-153 (April 1953).

Wood is chlorinated and treated with $NaHSO_3$ soln. to give an aqueous soln. of lignin sulphonic acids. 0.01 N. Polymethyl glycol chitosan soln. is added and the excess titrated with 0.0025 N. potassium polyvinyl sulphate soln. Equivalent weights of lignins have been determined and the influence of temperature, chlorination, sulphonation and pH on the method examined. The method has been applied to estimation of the bleaching capacity of cellulose. A linear relation between the polyamino number of Kraft cellulose and its lignin content has been found. Results and experimental conditions are discussed. W. R. M.

Hydrocellulose Water Flow Number. O. A. Battista, J. A. Howsmon and S. Coppick. *Ind. Eng. Chem.*, **45**, 2107-2112 (Sept. 1953).

Water may be filtered through hydrolysis-resistant residues of cellulose from samples having originally a high fibre orientation faster than through residues from samples having a low original orientation. The hydrocellulose water flow number has been developed to put these observations on a quantitative basis. The preparation of samples and apparatus for the determination of the flow number are described. A relationship between original fibre orientation and flow number has been shown using seven rayon samples and confirmed by X-ray diffraction and linear swelling methods of measuring fibre orientation. Factors, such as mechanical treatment and prehydrolysis, which may affect cellulose fine structure, have been characterised in terms of the hydrocellulose water flow number.

W. R. M.

Application of the Kubelka-Munk Theory to the Diffuse Reflection of Light from Paper. III—Surface Reflection and Light-scattering Coefficient of Paper. A. S. Stenius. *Svensk Papperstidning*, **16**, 607-614 (Aug. 1953).

A method for determining the surface reflectance factors is given and their influence on the reflectance values needed for calculating the scattering coefficient of a hand-made sheet analysed, no additional measurements being involved. The reflectance factors of the sheets are negligible if they are dried between blotting paper, but if mirror-polished drying plates are used the reflection factors must be taken into account if the results are to be comparable with those for dull hand-made sheets.

S. V. S.

Nomograph for use in Determining the Acid Figure of Leather. G. A. R. Taylor. *J. Soc. Leather Trades Chem.*, **37**, 181-183 (May 1953).

The use of a nomograph (which is reproduced in the paper) which enables the tedious arithmetic work entailed in determining the acidity of leather by the method of Aitkin and Thompson, is described. The pH values of aqueous extracts of three samples of the leather are determined, plotted against the logarithm of the dilution of the moisture in the original leather, the latter being derived from the nomograph, and the acid figure being obtained by extrapolation of the line which passes through these three points to zero dilution.

J. W. D.

Opacities of Water Pigment Finishes. H. F. Vollmann and J. Kendall. *J. Soc. Leather Trades Chem.*, **37**, 154-156 (May 1953).

The authors criticise the electrometric method proposed by J. S. Mudd and F. E. Downs (J.S.D.C., **69**, 272 (July 1953)) for measuring the opacities of water pigment finishes, and question the significance and validity of the results which it gives. Mudd and Downs' reply to these criticisms.

J. W. D.

PATENTS

Determining the Solids in Suspensions or Colloidal Solutions or the Solutes in Solutions. ICI.

BP 696,675

A primary beam of light is passed into a sample of the liquid to cause the solids or the solute to fluoresce, means being provided to indicate and/or record the intensity of the fluorescence.

C. O. C.

Yarn-testing Machine. Fibreglass. BP 694,585

A yarn-testing machine comprises a pair of yarn-supporting rollers spaced in a horizontal line, a loadable roller between them which is movable vertically, a guide roller or rollers with braking means, and a device for applying load. This is effected by winding one end of the yarn round a drum connected through a reduction gear to a motor, passing it over one guide roller, down and under the vertically movable loaded roller, back over the other guide roller, and so to the braking device, which prevents further pay-out of yarn when the motor is started. As the yarn is wound in, the movable roller lifts, and the yarn is forced to take a V shape with progressively increasing angle between the arms, until it finally snaps. The upward displacement of the movable roller is transmitted through a pointer to a scale. This procedure is particularly suited to glass yarns, which are too brittle to be held between the jaws of conventional devices.

J. W. B.

Content of Gelling and Stabilising Agents. (III p. 503).
Radiochemistry in Paint Research (V p. 510).
Ability of Colloid Solutions to form Fibres (VI p. 513).

XV— MISCELLANEOUS

Colouring Materials in Cosmetics. K. Beigwein.
Seifen-Öle-Fette-Wachse, 79, 198-200 (1953); *Chem. Abs.*, 47, 9573 (25 Sept. 1953).

A review of the use of natural and synthetic, inorganic and organic colouring materials in cosmetics. C. O. C.

Chronic Mercurialism in Italian Hat Factories.
G. Baldi, E. C. Vigliani and N. Zurlo. *Med. lavoro*, 44, 161-198 (1953); *Chem. Abs.*, 47, 9622 (25 Sept. 1953).

A review of over 300 cases of mercury poisoning that occurred in some Italian felt hat factories during 1942-52. Poisoning was produced by inhaling Hg vapours, no absorption through the skin having been noticed and the symptoms in all cases were the same as those produced by inhaling the vapour. There was 0.5-3.0 mg. Hg per cu.m. of air in these factories, the permissible limit in the U.S.A. being 0.10 mg./cu.m. C. O. C.

Inheritance of Minor Colour Vision Variations.
R. W. Pickford. *Nature*, 171, 1167 (27 June 1953).

Results of a study of 40 pedigrees revealing the inheritance of blue and yellow minor colour vision defects, collected while testing 649 men and 546 women, are discussed. J. W. B.

Bradford and its Worsted Industry under Victoria 1837-1901. E. M. Sigsworth. *J. Bradford Textile Soc.* 63-70 (1952-53).

A brief history with 24 references.

C. O. C.

The Bradford Industry from Elizabeth I to Anne.

M. W. Beresford. *J. Bradford Textile Soc.*, 71-76 (1952-53).

Historical.

C. O. C.

PATENTS

Coloured Gelatin Capsules. American Cyanamid Co. *USP* 2,624,163

Gelatin film, preferably before being formed into capsules, is treated with a dye solution so as to colour only desired portions of the surface of the film. This enables capsules in which various portions may be of either the same or different colours to be formed. C. O. C.

Colouring Copper and its Alloys. ICL. *BP* 697,294

A green patina is obtained on cupriferous surfaces by spraying them with an aqueous solution containing a double salt of copper and ammonium in absence of acid. A fine green patina is given by $\text{CuCl}_2 \cdot 2\text{NH}_4\text{Cl} \cdot 2\text{H}_2\text{O}$. To produce the natural blue-green patina obtained normally by long weathering, ammonium sulphate should be added to the solution. C. O. C.

Staining and Filling Wood. Chadeloid Corpn.

BP 698,698

An acid dye and an air-drying resin are dissolved in a hydroxylic solvent. The solution is then mixed with a hydrated calcium silicate filler to yield a combine stainer and filler for wood. C. O. C.

Robert Holme, Citizen and Merchant of York: a Fourteenth Century Dyestuff Importer (IV p. 509).

Lovely Fabrics Beautified by **Aridye**

To produce this attractive discharge print on black Viscose Taffeta, world famous British printers chose ARIDYE Pigment colours. Technically, this print is noteworthy for its clear definition, freedom from halo and good handle. Because of these and other advantages, including economy in production, the demand for ARIDYE Pigment Colours continues to increase.

Enquiries to:

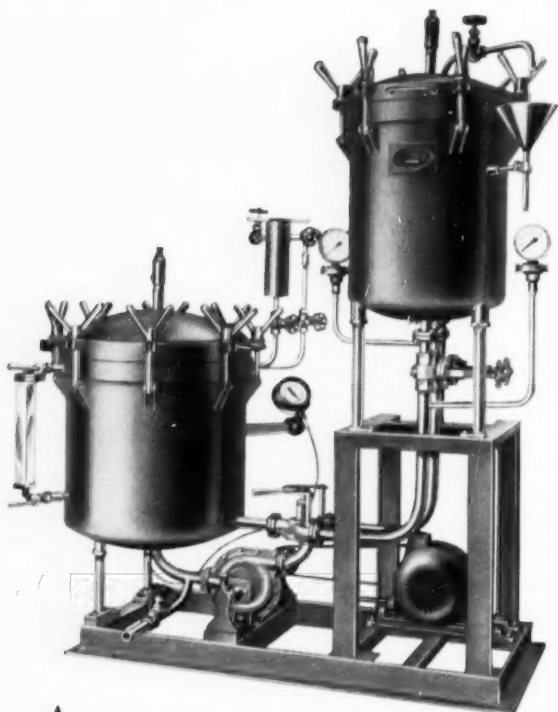
TENNANTS TEXTILE COLOURS LTD.

35/43, Ravenhill Road, Belfast or to the Area Distributors

Aridye Colours and the use thereof are protected by British Patents 522941, 523090, 524803, 552919, 561641, 561649, 531882.



High Temperature



PRESSURE DYEING SYSTEM

One of a group of Longclose
High Temperature pressure
machines operating success-
fully on commercial
production



*One of the comprehensive range of
Longclose Pressure Dyeing Machines*

Longclose cater for the dyer's every need
including a full range of commercial
machines for package and pack dyeing,
at temperatures up to 130°C



BOWMAN LANE WORKS
LEEDS 10 ENGLAND

Telephone 21978-9

SITUATIONS VACANT AND WANTED etc

Replies may be addressed "Box —, SOCIETY OF DYERS AND COLOURISTS," DEAN HOUSE, 19 PICCADILLY, BRADFORD, 1, YORKS., where all communications relating to these Advertisements, which are treated in strict confidence, should be addressed.

The Publications Committee is prepared to receive Advertisements relating to SITUATIONS VACANT, SITUATIONS WANTED, or MISCELLANEOUS ITEMS for insertion on this page of the Journal. Advertisements of Situations Wanted are gratis to individual members, but must not exceed twenty-four words in length.

All inquiries relating to Advertisements in the Journal should be addressed to THE GENERAL SECRETARY, THE SOCIETY OF DYERS AND COLOURISTS, DEAN HOUSE, 19 PICCADILLY, BRADFORD 1, YORKS.

SITUATIONS VACANT

COLOUR CHEMISTRY: A young man aged 20-25 of Inter B.Sc. or similar standard is required by a well-known textile organisation as assistant to the Colour Chemist of their dyeing/printing works. Some experience of textile printing is highly desirable. The opening is an interesting one in an expanding branch of the organisation. Details of age, qualifications and experience to Box V33.

CHEMIST. Tootal Broadhurst Lee Co., Ltd., have a vacancy for a young chemist of A.R.I.C. or equivalent standard in their Headquarters Testing Department. A knowledge of textiles is desirable but less essential than an interest in analysis and new analytical methods, coupled with ability to write a lucid report. Apply giving details of age, education, qualifications and experience to the Personnel Manager, 56 Oxford Street, Manchester, 1.

DYEING Machine Manufacturers have a vacancy for a keen young man aged 24 to 28, to train as Technical Salesman. Applicants should state experience and qualifications. The successful applicant would be given a course of training and would then be expected to deal with sales and after-sales service, good prospects. Box V32

DYEING TECHNOLOGY. British Nylon Spinners Limited invite applications from fully qualified Textile Chemists capable of handling, without supervision, both laboratory development work and technical service investigations. This is a senior position and candidates must have, in addition to a University Degree, a qualification of a recognised Institute and sound experience of the Textile Trade. The appointment will carry an attractive salary and there is a contributory Pension Fund. Applications should be addressed to the Personnel Manager, British Nylon Spinners Limited, Pontypool, Mon., and the fullest information will be given to those invited for interview.

WOOL INDUSTRIES RESEARCH ASSOCIATION

RESEARCH CHEMIST REQUIRED to develop analytical methods for wool research. The initial salary will be in the range £500-£800, with superannuation under the F.S.S.U. scheme. Applications should be sent to the Association, Torridon, Headingley, Leeds, 6.

WOOL INDUSTRIES RESEARCH ASSOCIATION

TECHNICAL OFFICER required for the study of the dimensional changes of woven cloth, especially in those processes used in garment manufacture. Previous textile experience would be an advantage, though not essential. Starting salary in the range £450-£700 p.a. with superannuation under the F.S.S.U. scheme. Applications should be sent to the Association, Torridon, Headingley, Leeds, 6.

THE BRADFORD DYERS' ASSOCIATION LTD. require **FOREMAN DYER** for rayon piece goods. Employment in the Bradford area. Progressive post; superannuation. Write, giving details of experience and salary required, to the Secretary, 39 Well Street, Bradford, marking envelope, "Private".

TECHNICAL MANAGER required for Bleaching and Finishing Dept. (including crease resist and embossing) of an American-owned mill in Peru, South America, processing cotton rayons, synthetic fibres and blends. Only applicants with the technical training and experience necessary to qualify them and take complete charge will be considered. Experience of screen printing will be an added advantage, but is not an essential qualification. Free furnished house, periodic home leave with pay and passages paid for family. Write giving full details, including age, family, status etc. to Box Z312 c/o Jackson's, 54 Old Broad Street, E.C.2.

TECHNICALLY trained assistant to slubbing dyer required. Reply in writing giving qualifications and salary required to Robert Clough (Keighley) Ltd., Grove Mills, Keighley.

WANTED Qualified Chemist, age 25-30, for Technical Service Laboratory in East London firm of Chemical Manufacturers, with three or four years' experience in Technical Service or Works Laboratory on Paint, Plastics or Textiles, preferably all three. Salary according to experience, age and qualifications. Temporary hostel or lodging available. Box V34

SITUATIONS WANTED

A.T.I. — aged 39, British. Fulltime higher diploma in Textiles (Dyeing and Finishing), four years' experience in rayon producing factory. Quality control, analytical techniques in the chemistry lab., textile testing bureau, analysis, testing, interpretation of results, dyeing-finishing-colour matching on laboratory scale. Will accept any responsible position with similar technical approach. Enthusiastic in development work. Suitable post in Canada will be considered. Box W519

MEMBER, 40, desires change. Technical, managerial experience dyeing, finishing woven, knitted goods, footwear, most fibres. Interested also development, technical service. Overseas appointment considered, South Africa preferred. Box W520

MISCELLANEOUS

THE proprietors of British Patent No. 606896 for "Improvements in or relating to the Dyeing of Artificial Fibres" are prepared to enter into negotiations for the SALE of the patent or for the grant of a LICENCE thereunder. Inquiries should be addressed to Carmichael & Ransford, 24 Southampton Buildings, Chancery Lane, London W.C.2.

MEMBERS AND JUNIOR MEMBERS

Persons desirous of joining the Society as Ordinary Members or Junior Members may obtain Application Forms from the General Secretary, or from the Honorary Secretary of any Section of the Society

NEW MEMBERS

Anderson, O., 49 Benview Street, Glasgow, N.W.
Barnes, K. J., 44 Cromwell Road, Beeston, Notts.
Burez, P., Broecke, gl. Renaix (F-0) Belgium
Chownyk, J., 329 King Street, Preston, Ont., Canada
Cowgill, E., I.C.I. Ltd., Dyestuffs Div., Hexagon House, Dyehouse Dept., Blackley, Manchester 9
Cox, Miss P., 15 Sunnyside Road, Chilwell, Beeston, Notts.
Davenport, V., C.P.A. Ltd., St. James's Buildings, Oxford Street, Manchester 1
De Visscher, M. C., Ham, 144, Ghent, Belgium
Dougans, J. W., Barr's Chemical Co. Ltd., 34 York Street, Glasgow C.2
El Ghoroury, E. S., 10 Karam Abd El Hady Street, Cairo (Manyal), Egypt
Fettes, A. H., 770 Armour Road, Peterborough, Ont., Canada
Findlow, H. H., Rusheley, 60 Congleton Road, Macclesfield, Cheshire
Habermehl, H. A., Box 173, Hespeler, Ont., Canada

Hickey, E. H., Glenmore, Lisburn, Co. Antrim
Lenton, A. I., Richard Haworth & Co. (Mfg.) Ltd., Ordsall Lane, Salford 5
Millar, J., 21 Alexandra Road, Well End, near Barnet, Herts.
Revie, F., 8 Aberfoyle Street, Glasgow, E.1
Scott, P. E., R.F.D.C. Co. Ltd., Catteshall Lane, Godalming, Surrey
Suzuki, T., 36 Victoria Avenue N., Hamilton, Ont., Canada
Swain, G. R., I.C.I. Ltd., 122 Granby Street, Leicester
Whittaker, Mrs. M., 37 Prince Edward Avenue, Denton, near Manchester

NEW JUNIOR MEMBERS

Cornforth, Miss E., 117 Primeville Street, Leghams Lane, Bradford
Heywood, D. W., 33 Heron Street, Pendlebury, Manchester
Oldfield, N., 240 Burley Road, Leeds 4

MEMBERS' CHANGES OF ADDRESS

- Appleyard, J. N., formerly of 979 Scott Hall Road, Leeds, to The Old Cottage, Grey Court, Gledhow Lane, Leeds 8
- Barton, D., formerly of 47 Portslade Avenue, Hove 3, to 53 St. Andrew's Road, Portslade, Sussex
- Beath, W. R., formerly of Manchester College of Technology, to 26 Birch Grove, Manchester 4
- Burnthall, E. V., formerly of 34 Bayview Avenue, Quebec, to Box 2003, Arnprior, Ontario, Canada
- Butcher, J. V., formerly of 10 Spring Road, Leeds 6, to Dept. of Colour Chemistry and Dyeing, Leeds University, Leeds 2
- Butterworth, K., formerly of 21 Moorgate Avenue, Rochdale, to c/o John Walton of Glossop Ltd., Longdendale Works, Hollingworth, Cheshire
- Chrzanowski, S. N., formerly of 29 Stoneycgate Road, to 2 College Street, Leicester
- Edgar, W., formerly of 15 Bentheads, Bannockburn, to Easter Livlands, St. Ninians, Stirling, Scotland
- Gray, J., Ltd., formerly of "Greenhill", Linnally, to Moss Road, Lambeg, Lisburn, N. Ireland
- Holdsworth, R., formerly of 210 Towngate, Clifton, to 1 Rosemary Lane, Raistrick, Brighouse
- Jones, R. L., formerly of Manchester College of Technology to c/o "Fields View", Tarporey Road, Whitechurch, Shropshire
- Kalinowski, T., formerly of 42 Newcastle Road, Leek, to c/o 35 Ball Haye Green, Leek, Staffs.
- Kresowski, C., formerly of 17 Bedford Avenue, to 10 Hastings Avenue, Chorlton cum Hardy, Manchester 21
- Matchar, B. S. I., formerly of Birla Nagar, Gwalior MB., to 22 2nd Bhatt Wadi, Girgaon, Bombay 4, India
- Mecklenburg, G. K., formerly of Park Crescent, Abergavenny, to 30 Western Avenue, Newport, Mon.
- Newton, L. S., formerly of 20 Stonefield Avenue, Paisley, Scotland, to 6 Hill Top Avenue, Cheadle Hulme, Cheshire
- Pieczka-Parker, J., formerly of 6 Tanybryn, Glamorgan, to 5 Florida Gardens, Middlesbrough
- Preminger, E., formerly of 38 Cornwall Road, Harrogate, to Lambskin Ltd., 21 Montifore Street, Tel Aviv, Israel
- Quin, R. S., formerly of 36 Yarravale Road, Melbourne, to c/o Hilton Hosiery Ltd., 291 Albion Street, West Brunswick, Melbourne, Australia
- Reis, A. A. G., formerly of Fagley House, Eccleshill, to 17 Marlborough Road, Manningham Lane, Bradford
- Smith, A. F. P., formerly of Molte, Denmark, to 34 Buckingham Road, Cheadle Hulme, Cheshire
- Tinsdale, C. D., formerly of 135 Cowlersley Lane, Huddersfield, to The Bangalore Woollen, Cotton and Silk Mills Ltd., Bangalore 2, India
- Unwin, H., formerly of c/o Julius Kayser & Co. Ltd., Fountain Inn, to P.O. Box 365, Easley, South Carolina, U.S.A.
- Waterhouse, F. M., formerly of Dhariwal, E. Punjab, India, to "Green Lea", Marsden, near Huddersfield
- White, C. J., formerly of 15 Sandycove Avenue, Co. Dublin, Eire, to c/o Stour Valley Dyeworks Ltd., Church Square, Bures, Suffolk
- Winkler, A., formerly of 7 Warneford Road, Huddersfield, to Carr House, Low Lane, Birstall, near Leeds

ADDRESSES WANTED

- Brun, J. S., formerly of P.O. Box 20, Bergen, Norway
- Crummett, A., formerly of 14 St. Austell Road, Manchester 16
- Evelbauer, H. L., formerly of Friedrichster F., Marburg (16), Hessen, U.S. Zone, Germany
- Holt, J., formerly of "Greystones", St. Martin's Road, Marple, Cheshire
- Kazan, R. E., formerly c/o Howards & Sons Ltd., 815 Castle Buildings, 1410 Stanley Street, Montreal, P.Q., Canada
- Midgley, F. B., formerly of 27 Scholes Lane, Scholes, near Cleckheaton
- Nayar, K. N. S., formerly c/o U.T.M. Ltd., Anchor Mills, Paisley, Scotland
- Southwell, G., formerly of Hillcrest House, Scotchman Lane, Batley, Yorks.
- Sykes, J. H., formerly of 75 Hill Crescent, Howden Clough, Birstall, near Leeds
- Taylor, F. G., formerly of 4 Nevanthor Road, Leicester

LEWIS'S SCIENTIFIC & TECHNICAL BOOKSELLERS

Any book on the General and Technical Sciences supplied from stock or obtained to order.
Catalogues on request. Please state interests.

LENDING LIBRARY • Scientific and Technical

ANNUAL SUBSCRIPTION FROM TWENTY-FIVE SHILLINGS PROSPECTUS POST FREE ON REQUEST

SECOND-HAND DEPARTMENT

Large stock of recent editions of scientific and technical books. Old and rare books sought for and reported.

140 Gower Street WC1

H K LEWIS & Co Ltd 136 Gower Street, London WC1

Business hours — 9 a.m. to 5 p.m. Saturdays to 1 p.m.

Telephone EUSton 4282 (7 lines)

What is the **SIZE** of the world



TRAGON Pure Locust Bean Kernel Flour.
Without Equal for—

SIZING All yarns and fibres, pure and heavy
sizing. Especially suitable for spun rayon.

FINISHING Full feel without hardness. Gives
a clear, bright and lasting finish.

CALICO PRINTING Printing Pastes.

EMULSIONS Stabiliser and thickener.

TRAGON

TRAGASOL PRODUCTS LTD HOOTON CHESHIRE

Telephone Hooton 2031-2

Telegrams TRAGASOL LITTLE SUTTON

cvs-61

FAMOUS STEPPING STONES

at Ambleside Westmorland



Staveley basic chemicals are the stepping stones to a hundred-and-one industrial chemicals and dyestuffs.

Textile processes such as bleaching and scouring also use Staveley chemicals.

STAVELEY

The name Staveley has signified the highest standard of quality for over 200 years.

BASIC CHEMICALS FOR INDUSTRY

LIQUID CHLORINE

BLEACHING POWDER

SODIUM HYPOCHLORITE

SULPHURIC ACID

HYDROCHLORIC ACID

THE STAVELEY IRON & CHEMICAL CO LTD near CHESTERFIELD



Mobility plus **ADAPTABILITY**

The inherent characteristics of the Mono Pump provide all the essentials for an efficient portable pumping unit. Constructed on robust lines, the total weight is moderate and the unit is compact enough to be moved with ease or to negotiate a standard doorway. The mechanism is simple and there are no valves to adjust. Unfailing self-priming and powerful suction ability make casual pumping duties a quick and easy operation. With its uniform velocity of flow, the Mono Pump is able to handle free-flowing or viscous fluids and it can be applied to transfer or filtering duties. Cast-iron, Gunmetal or Stainless Steel units are available.



The
MONO
pump

MONO PUMPS LTD

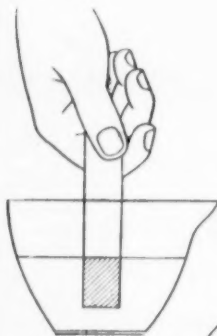
MONO HOUSE, 67 CLERKENWELL ROAD, LONDON, E.C.1

Telephone: Holborn 3712 (6 lines)

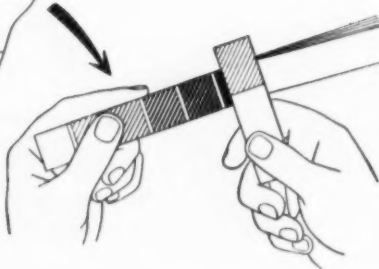
Cables: Monopumps, London • Code: A.B.C. 7th Edition

and at Birmingham, Dublin, Glasgow, Manchester, Newcastle, Wakefield,

MP223 /L4066D



Simplified pH measurement



JOHNSONS OF HENDON draw the attention of chemists and manufacturers to this series of five test papers for the measurement of pH values.

UNIVERSAL test paper covers a pH range from one to ten in steps of one unit. The colour range extends from red, through orange, yellow and green to blue and is accurate to within 0.5 pH. For work requiring a higher degree of accuracy there are the **COMPARATOR** test papers in four kinds. These cover pH 3.6 to 5.1, to 6.7, 6.8 and 8.4 to 10. Each book has six colours printed inside, together with figures, arranged in steps of 0.3 pH.

Invaluable to chemists and research workers. Descriptive leaflet sent free on request

JOHNSONS

OF

HENDON

LTD

LONDON NW 4

Established 1743



SIFTA SAM CAN SUPPLY

SALT
as fine as **FLOUR**

Trade Inquiries Invited

PALMER MANN & CO LTD SIFTA SALT WORKS
SANDBACH CHESHIRE

Telephone Sandbach 152 (3 lines)

Telephone Dudley Hill 253 & 254 (Private Branch Exchange)

Telegrams BISULPHITE BRADFORD

J B WILKINSON (CHEMICALS) LTD

Manufacturer of

SODIUM HYDROSULPHITE POWDER
and CHEMICALS FOR DYERS BLEACHERS PRINTERS
and all Branches of the Textile Industry

DUDLEY HILL CHEMICAL WORKS BRADFORD

CHAS. FORTH & SON
LIMITED

CHEMICALS
for Dyers & Bleachers

ACIDS ALKALIES SOAPS



DYESTUFFS
for all purposes

DYEWOOD EXTRACTS HEMATINES

Telephones 75147—75148

Code A B C 5th Edition

NEW BASFORD
NOTTINGHAM

Telegrams

DELTA-NOTTINGHAM

AMOA CHEMICAL CO LTD

HINCKLEY LEICESTERSHIRE

for

LAMOA TS THE IDEAL DETERGENT

Samples and Literature Available

Quality Dyes and Products



Recent additions—

Superian Astrol B
Cyanine Fast Blue BL
Superian Blue AR
Monochrome Fast Yellow C
Superian Rubinel B

For samples and quotations, apply—

L B HOLLIDAY & Co LTD HUDDERSFIELD

The Theory and Practice of Wool Dyeing

(SECOND EDITION)

(231 pages — illustrated)

by

C L BIRD M.Sc F.R.I.C

Lecturer in Dyeing at The University of Leeds

price 15/- post free

Orders should be forwarded together with remittance to
THE SOCIETY OF DYERS AND COLOURISTS
19 PICCADILLY BRADFORD YORKSHIRE



BROWN & FORTH

LIMITED

FOUNDED 1890

Sole U K Distributors
of

DYESTUFFS AND INTERMEDIATES

manufactured by

E I du Pont de Nemours
& Co (Inc) U S A

83-117 EUSTON ROAD 118 CHORLTON ROAD
LONDON NW1 MANCHESTER 15
EUS 5101-5 MOS 1347-8

AND AT NEW YORK

SECOND EDITION REVISED AND ENLARGED

IDENTIFICATION OF DYES ON TEXTILE FIBRES

and

DETECTION OF METALS IN
FIBROUS MATERIALS, DYES,
AND ORGANIC PIGMENTS

by

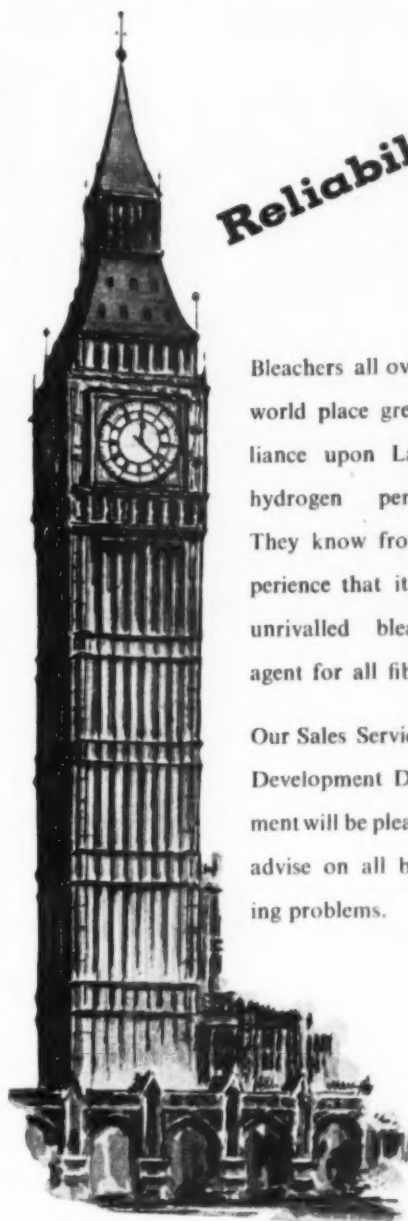
ELLIS CLAYTON F.R.I.C

Price 10/6 net

Orders together with remittance should be
sent to the

GENERAL SECRETARY
THE SOCIETY OF DYERS AND COLOURISTS
19 PICCADILLY BRADFORD
YORKSHIRE

Reliability



Bleachers all over the world place great reliance upon Laporte hydrogen peroxide. They know from experience that it is an unrivalled bleaching agent for all fibres.

Our Sales Service and Development Department will be pleased to advise on all bleaching problems.

HYDROGEN PEROXIDE BY

LAPORTE



LAPORTE CHEMICALS LTD., LUTON

Telephone: Luton 4390 Telegrams: Laporte Luton

COLNE VALE

DYE & CHEMICAL CO LTD

MANUFACTURERS OF

BISMARCK BROWN R and Y
Conc. and Base
PURE CHRYSOIDINE Y D and
R D and Base
INDULINE (Water Soluble)
INDULINE (Spirit Soluble)
INDULINE BASE
NIGROSINE (Water Soluble)

NIGROSINE (Spirit Soluble)
NIGROSINE BASE
BASIC MAGENTA
ROSANILINE BASE
ACID MAGENTA Conc.
PURE SOL. BLUE 1 Conc.
PURE SOL. BLUE 3 B Conc.
SOLUBLE BLUE Conc.

WATER BLUE R Conc.
DK BLUE N and B N
DK BLUE SPECIAL
SPIRIT BLUE
INDIGO CARMINE C V Ex.
LAUNDRY BLUES
METACHROME MORDANT

Also full range of ACID, BASIC, DIRECT and CHROME COLOURS
Samples and Prices will be forwarded on application

MILNSBRIDGE HUDDERSFIELD

Telegrams ANILINE HUDDERSFIELD

Telephone Milnsbridge 3

GEOMETRIC GREY SCALE

*for Assessing the Effect on the Pattern
in Fastness Testing*

PRICE

6/-

from

THE SOCIETY OF DYERS AND COLOURISTS
19 PICCADILLY

BRADFORD YORKSHIRE ENGLAND

Aniline & Alizarine Colours

Solvents & Chemicals

We solicit your inquiries
for Aniline and Alizarine
Colours and Chemicals
and shall be pleased to
forward samples and
prices on application

**HYDROGEN
PEROXIDE**
(CONCENTRATED)

Free from all impurities Prompt deliveries from stock

COLE & WILSON LTD

24 GREENHEAD ROAD HUDDERSFIELD

Telephone Huddersfield 1993

Telegrams COLOUR HUDDERSFIELD

WORKS — Common Road Bay Hall Birkby Huddersfield
Telephone Huddersfield 2490

ESTABLISHED 1877

We have been Manufacturing

DYESTUFFS

for more than Seventy Years!

*Why not avail yourself of our long
experience? It is freely at
your disposal.*

Williams HOUNSLOW Ltd.

HOUNSLOW



MIDDLESEX

**PUBLICATIONS of the
SOCIETY OF DYERS AND COLOURISTS**

(All publications are sent post free)

JOURNAL OF THE SOCIETY OF DYERS AND COLOURISTS
(published monthly) Price to Non-members per annum **£4**

THE THEORY AND PRACTICE OF WOOL DYEING (Second Edition)
By C L BIRD Price **15s**

**IDENTIFICATION OF DYES ON TEXTILE FIBRES AND
DETECTION OF METALS IN FIBROUS MATERIALS, DYES,
AND ORGANIC PIGMENTS** (Second Edition)
By ELLIS CLAYTON Price **10s 6d**

SECOND REPORT OF THE FASTNESS TESTS COMMITTEE
Price **2s 6d**

**REPORTS OF THE COMMITTEES ON THE DYEING
PROPERTIES OF DIRECT COTTON, VAT, AND WOOL DYES**
Price **5s**

THE TINCTORIAL ARTS TO-DAY
Proceedings of a Conference held at Harrogate in September 1951
Price **15s** Members **£1 5s** Non-members

PHOTOCHEMISTRY IN RELATION TO TEXTILES
Proceedings of a Symposium held at Harrogate in September 1949
Price **£1** Members **£1 10s** Non-members

**RECENT ADVANCES IN THE THEORY AND
PRACTICE OF DYEING**
Unbound Volume of the Proceedings of a Symposium held at
Blackpool in September 1947
Price **15s**

REVIEW OF TEXTILE PROGRESS
Volume I 1949 **£1** Volume II 1950 **£1 5s** Volume III 1951 **£1 15s**
(£1 8s to T.I.&S.D.C. Members)

THE SOCIETY OF DYERS AND COLOURISTS
19 PICCADILLY BRADFORD 1 YORKSHIRE ENGLAND

Even Water needs control

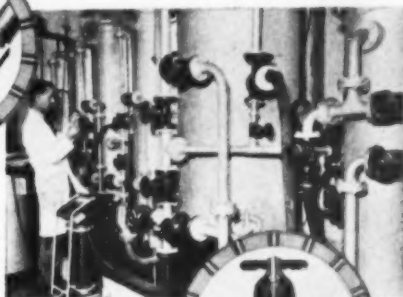
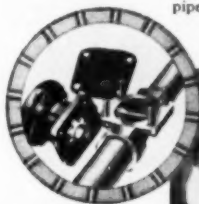
To judge by the number of Saunders Valves in the Permutit Test Laboratory shown here, there is need for control of water at several points.

And the need is for sureness of control, which the Saunders flexible diaphragm gives even if solid impurities are present in the fluid. Maintenance, too, is easy since in the Saunders Valve, there are no seats to grind: instead, by the simple replacement of a diaphragm—the work of a few minutes—the valve is as good as new.

And always, that diaphragm isolates fluid from mechanism and mechanism from fluid—for the good of both.

Readily dismantled
without disturbing
pipelines

Photograph by permission of
The Permutit Company Ltd
showing Saunders Diaphragm
Valves in the Permutit Test
Laboratory



Illustrating
the stream-
line flow



Is there a copy of the Saunders Technical
Handbook on your bookshelf? Types, sizes,
methods of operation and a list of applications
will help selection for your particular purpose

SAUNDERS VALVE COMPANY LIMITED

Diaphragm Valve Division

CWMBRAN · MONMOUTHSHIRE · ENGLAND

NAPHTANILIDES

BASES

FAST COLOUR SALTS

for the Dyer



★ **T SAVILLE WHITTLE LTD** ★
49 Princess Street MANCHESTER 2

Textile Auxiliaries

Desizing Agents
Detergents
Wetting Agents
Finishing Agents
Mercerising Assistants
Metal Sequestering Agents



NORMAN EVANS & RAIS LIMITED

Dudley Road

Manchester 16

Telephone Moss Side 2277

Telegrams CHRIEVAN

Brilliant Avirols

(ANION ACTIVE FINISHING AGENTS)



FOR A PERFECT HANDLE
ON SPUN RAYON FABRICS



No adverse effect on dyed shades

THE GARDINOL CHEMICAL CO LTD MILNSBRIDGE HUDDERSFIELD

Telephone MILNSBRIDGE 287

Notice to Authors of Papers

The MSS. of all papers communicated to or read before the Society become the property of the Society. They should be addressed to the Editor, Society of Dyers and Colourists, 19 Piccadilly, Bradford 1. Authors must not allow their papers to be published elsewhere before they have appeared in the Society's *Journal*. Should prior publication take place without the sanction of the Publications Committee, the paper will be printed only as an abstract or summary.

Manuscripts submitted for publication in the *Journal* should be typewritten (double spacing) on good-quality paper, using one side of the paper only and leaving a margin at least 1 in. wide on the left-hand side. The time taken in refereeing papers (both lectures and communications) will be reduced to a minimum when authors submit two copies of the typescript.

In view of the high costs of publication, it is essential that authors should be as concise as possible. When experimental procedure has already been published, a literature reference to the paper containing the details is sufficient, whilst well known experimental methods should be described very briefly.

Introductory paragraphs describing the aims of the investigation and the method of attack are desirable, and should be followed by the experimental results and their discussion. There should be a brief summary for insertion at the beginning of the paper. References to the literature should be numbered consecutively, using superscript numbers without brackets immediately following the text words or author's name to which they refer.

The list of references should be given at the end of the manuscript and the abbreviations used should be, as far as possible, those given in the "List of Periodicals Abstracted" included at the end of the Index to the preceding year's *Journal*. Reference numbers in this list should be neither enclosed in brackets nor followed by full-stops. As far as possible throughout the manuscript the abbreviations listed in the Jan. 1950 issue (p. 54) should be used. Tables should be numbered consecutively in Roman numerals and Figures in Arabic numerals.

The number of figures and graphs should be kept as low as possible, and data should be presented in the form of either tables or graphs, not both. Drawings should be carefully prepared, preferably in Indian ink, on plain white drawing paper or, preferably, Bristol board. In graphs, the frame and actual curves should be ruled and inked more heavily than any co-ordinate lines, and the latter should not be close together as in ordinary graph paper. Experimental points should always be given, and where several graphs appear in a single Figure clear means of differentiation must be adopted. All numbers and legends are set up in type by the printer, and authors should therefore indicate them lightly in pencil.

Twenty-five free copies of a reprint are supplied to the author of an original paper published in the *Journal*, or fifty free copies are supplied when there are two or more authors, and a further number may be purchased from the Society at the rates given below.

REPRINTS OF LECTURES AND COMMUNICATIONS

Reprints of all lectures and communications are available after publication to members and non-members of the Society. The charges (postage included) are as follows—Single copies 2s. 6d. each; per dozen copies up to and including 8 pages, 12s. 6d., and for papers occupying more than 8 pages of the *Journal*, 17s. Orders should be addressed to "The Society of Dyers and Colourists, 19 Piccadilly, Bradford 1". They can be accepted only if accompanied by remittance and if received immediately after publication of the paper.